

# LevelPRO

## Continuous Gamma Level System

Installation Guide

P/N 717760

Revision B





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# Revision History

Revision Level	Date	Comments
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# Safety Information & Guidelines

This section contains information that must be read and understood by all persons installing, using, or maintaining this equipment.

## Safety Considerations

Failure to follow appropriate safety procedures or inappropriate use of the equipment described in this manual can lead to equipment damage or injury to personnel.

Any person working with or on the equipment described in this manual is required to evaluate all functions and operations for potential safety hazards before commencing work. Appropriate precautions must be taken as necessary to prevent potential damage to equipment or injury to personnel.

The information in this manual is designed to aid personnel to correctly and safely install, operate, and / or maintain the system described; however, personnel are still responsible for considering all actions and procedures for potential hazards or conditions that may not have been anticipated in the written procedures. **If a procedure cannot be performed safely, it must not be performed until appropriate actions can be taken to ensure the safety of the equipment and personnel.** The procedures in this manual are not designed to replace or supersede required or common sense safety practices. All safety warnings listed in any documentation applicable to equipment and parts used in or with the system described in this manual must be read and understood prior to working on or with any part of the system.

**Failure to correctly perform the instructions and procedures in this manual or other documents pertaining to this system can result in equipment malfunction, equipment damage, and / or injury to personnel.**

## Warnings, Cautions, & Notes

Warnings, cautions, and notes are used throughout this manual to alert users to potential hazards or important information. **Failure to heed the warnings and cautions in this manual can lead to injury or equipment damage.**



**Warning** Warnings notify users of procedures, practices, conditions, etc. which may result in injury or death if not carefully observed or followed. The triangular icon displayed with a warning varies depending on the type of hazard (general, electrical, radiation). ▲



**Caution** Cautions notify users of operating procedures, practices, conditions, etc. which may result in equipment damage if not carefully observed or followed. ▲



**Note** Notes emphasize important or essential information or a statement of company policy regarding an operating procedure, practice, condition, etc. ▲



**Tip** Tips may also be used in this manual. They are suggestions or things to consider that will help you use the instrument or this manual. ▲

# Chapter 1

## Product Overview

Refer to the LevelPRO user guide for descriptions of instrument functions and features.

### **Associated Documentation**

In addition to this guide, the following documents must be read and understood by all persons installing, using, or maintaining this equipment:

- LevelPRO user guide (P/N 717778)
- Gamma Radiation Safety (P/N 717904)

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## Chapter 2

# Handling & Storage

This chapter addresses procedures for handling electrostatic discharge (ESD) sensitive equipment, as well as procedures for unpacking, inspecting, and storing of the system.



**Caution** This system is an ESD sensitive instrument. Use proper ESD protective equipment and procedures. Failure to comply with ESD procedures can result in circuit damage. ▲

## ESD Procedures

The instrument contains electronic components that can be damaged from discharges of static electricity: **Do not** touch the circuit board components. Ordinarily, handling the circuit boards by their edges will not damage the circuits.

Observe the following when installing, setting up, servicing, troubleshooting, or repairing the instrument:

1. Use an antistatic bag. Most instrument subassemblies are shipped in a special antistatic bag. When not installed, keep the assembly in the bag as often as possible.
2. Remove ESD sensitive subassemblies only under the following conditions:
  - a. When at a designated static-free workstation or when the bag is grounded at a field site.
  - b. After the conductive area of the container has been neutralized.
  - c. After making firm contact with an antistatic mat and / or firmly gripping a grounded individual.
3. Personnel handling ESD sensitive devices should be neutralized to a static-free workstation by means of a grounding wrist strap that is connected to the station or to a good grounding point at the field site.
4. Do not allow clothing to make contact with ESD sensitive devices.

5. Avoid touching edge connectors and components.
6. Avoid partially connecting ESD sensitive devices. These devices, especially the power supply connector, can be damaged by floating leads.
7. Ground test equipment.
8. Avoid static charges during troubleshooting.

## Unpacking, Inspection, & Storage



**Note** Inspection, adjustment, installation, and maintenance of the instrument must be performed by experienced personnel only. ▲

1. Upon receipt, inspect the instrument for damage that may have occurred while in transit. If there is evidence of rough handling or damage, file a damage claim with the transportation company immediately. Notify Thermo Fisher and / or your sales representative as soon as possible.
2. Carefully inspect the packing material prior to discarding it to ensure that all equipment and instruction paperwork has been removed.
3. Use the original packing material and container for storage if necessary.
4. If storing the instrument, the storage environment should be protected, free from extremes of temperatures and high humidity, and fall within the environmental constraints listed in the [specifications](#).

## Packing, Shipping, Transporting, & Receiving

All personnel involved in the packing, shipping, or receiving of hazardous material must be trained in accordance with the United States Department of Transportation (DOT) and OSHA hazardous materials regulations or in accordance with the Canadian Nuclear Safety Commission (CNSC) regulations.



## Chapter 3

# Hardware Installation

Read the Gamma Radiation Safety Guide (P/N 717904) PRIOR TO installing the equipment.



**Tip** Copies of the drawings referenced in this manual are provided in [Appendix C](#). ▲

For detector-transmitter housing layout details, refer to drawing [868502](#). For mounting dimensions, refer to drawing [868672](#) or [868674](#) for water-cooled units.

A variety of source housings are used with the scintillation detector depending on the requirements of the application. Refer to the appropriate drawing for your source.

## Licensing



**Warning** The instrument is a nuclear device regulated by federal and / or state authorities. You are responsible for knowing and following the pertinent safety and regulatory requirements. Refer to the Gamma Radiation Safety Guide (P/N 717904) for a summary of these requirements. ▲



**Warning** Moving or removing an installed source housing or any assembly that includes a source housing requires a person who is specifically licensed to install and commission Thermo Scientific source heads. ▲

In the United States, your general license permits you to own and install all of the instrument's components, including the source head. However, you may not commission the instrument (remove the lock and open the source housing shutter for the first time) without a specific license authorizing radiation commissioning of the instrument. In Canada, you are only allowed to remove the instrument from the shipping container if your CNSC license has a condition authorizing mounting / dismounting of devices. For assistance obtaining a license and / or commissioning / decommissioning the instrument, [contact Thermo Fisher](#).

## Source-Detector Configurations

The gauge is comprised of one or more source heads and one or more detector-transmitter units. Source heads are available in a point source or strip source configuration. Point sources have a fan-shaped beam, and for most point sources, the beam angle spreads at a 45° angle in the vertical dimensions (30° angle for the Model 5210). Strips sources emit radiation evenly along the length of the vessel from the source and measure the radiation level reaching the detector after passing through the vessel walls and the process material.

The scintillation detector is available in lengths ranging from 1 to 12 feet, in 1-foot increments. For a tall or narrow tank, multiple sources and / or detectors might be required. The specific source head / detector configuration depends on the application. Three possible configurations are illustrated below.

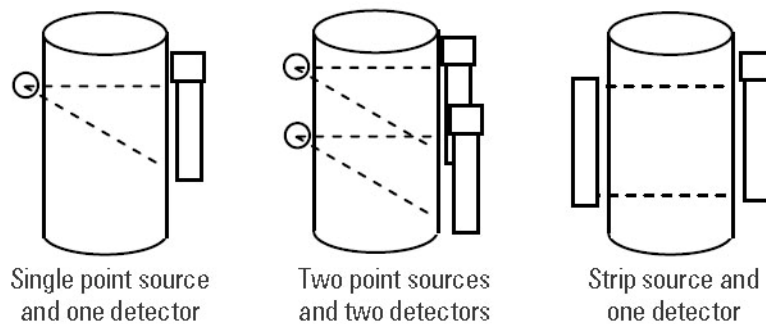


Figure 3-1.

### Guidelines



**Warning** Do not install the system in any hazardous area other than those approved. Refer to the equipment tag for the specific approvals applicable to the configuration of your instrument. ▲



**Warning** Do not apply power to the instrument in any hazardous area unless the safety ground is properly wired inside the instrument and the cover is properly installed. ▲

Instrument approvals are listed in [Appendix B](#).

### General

Review the following guidelines when planning gauge installation:

1. Correct power source is available. See “[Power Requirements](#)” later in this chapter.
2. You will need to supply the necessary brackets and hardware required for mounting the gauge to the vessel.

3. Operating temperature range: -40°C to +60°C (-40°F to +140°F).
4. There should be enough clearance to install and service the source and detector-transmitter. Refer to the appropriate drawings for your type of gauge and mount.
5. Position the source housing so the radioactive source identification tag is visible. Mount it so the tag is upright.
6. The gauge **should not** be mounted where process overflow or other material can collect in the beam path. The source shutter mechanism must be kept free of debris.
7. If the handheld terminal will be used for configuration, the connection must be located in a safe area.
8. There should be enough clearance to install and service the source and the detector. Refer to the dimensional drawings in the [drawing appendix](#).

## **Power Requirements**

Ensure the correct power source is available. One of the following input power sources is required: 24 Vdc  $\pm$  20% or 115/230 Vac  $\pm$  15%, 50/60 Hz (requires optional AC power board). The maximum power requirement is 12 VA. Both DC and AC power may be supplied to the gauge at the same time. The gauge will draw power from whichever input source provides the higher DC source voltage.

## Detector-Transmitter



**Warning** Do not install the system in any hazardous area other than those approved. Refer to the equipment tag for the specific approvals applicable to the configuration of your instrument. ▲



**Warning** Do not apply power to the instrument in any hazardous area unless the safety ground is properly wired inside the instrument and the cover is properly installed. ▲



**Warning** For hazardous location installations, the cable entries must be sealed per the [installation layout drawing \(868502\)](#). ▲



**Warning** For non-hazardous location installations, the enclosure cable entries must be sealed with a compound to protect against the passage of gas or vapors. The sealing compound should not be affected by the surrounding atmosphere or liquids. The sealing compound must have a thickness of at least 5/8 inch (16 mm). ▲



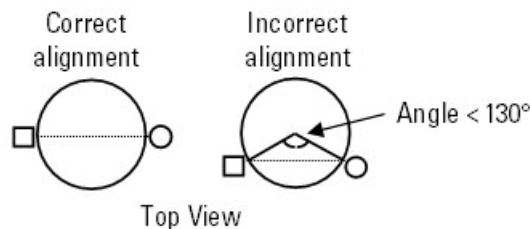
**Warning** Use proper lifting procedures during installation to avoid injury. Refer to drawings [868672](#) or [868674](#) (water-cooled units) for weights and dimensions of the detector housing. ▲

## Alignment

Refer to drawings [868502](#) and [868672](#) ([868674](#) for water-cooled units) for mounting dimensions of the detector-transmitter.

The source housing and detector are normally installed across the diameter of the vessel. If mechanisms internal to the process vessel would interrupt the radiation beam, you can move the installation slightly off center.

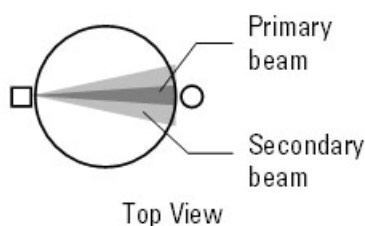
[Contact Thermo Fisher](#) if the angle between the source and detector will be less than 130°, as illustrated below.



**Figure 3-2.**

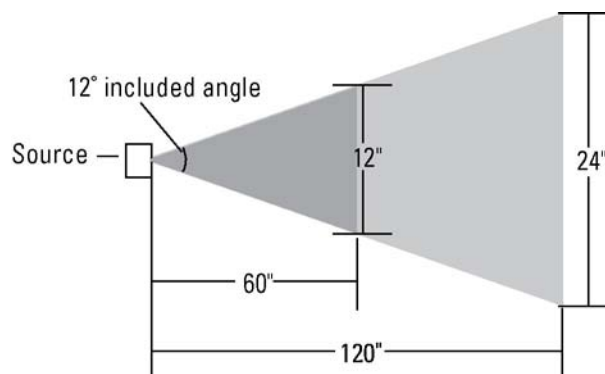
It is important to mount the gauge head securely, since any movement or change in alignment can affect the gauge's calibration. When mounting the source, be sure to include a means of aiming the beam several degrees left or right so the source beam can be aligned with the detector. The exact mounting method will vary depending on the application.

Align the center of the source beam path as closely as possible with the centerline of the detector housing. The source beam is narrow horizontally, and the radiation is uniform only in the primary (center) part of the beam. The shielding in the source housing attenuates the radiation in the secondary part of the beam. The sensitive area of the detector is the center 2-7/8 inches (73 mm) across the width of the detector's housing. This area should lie entirely within the primary beam.



**Figure 3-3.**

To determine the primary beam width, you will need the included angle of the beam, which is typically approximately 12°. For each degree, the beam will be 1 unit wide for every 60 units from the source. For example, if the include angle is 12°, the primary beam width will be 12 inches wide 60 inches away from the source head. At 120 inches from the source head, the beam width will be 24 inches, and so on. This is illustrated in the figure below.



**Figure 3-4.** Determining primary beam width

## Measurable Range

Before beginning the installation, verify that the measurable range (the range over which the process level can be measured) of the proposed installation meets the requirements of your application. The top and bottom of the measurement range depend on the source type (fan or strip), the detector length, and the position of the source relative to the detector's sensitive length. Sensitive length refers to the part of the detector that senses radiation.



**Tip** The sensitive length of the detector is approximately the length from the upper mounting bolt to the lower mounting bolt. ▲

### Top of Range

For a fan source, the top of the range is at the top of the sensitive length of the detector or at the center of the source housing, whichever is lower.

For a strip source, the top of the range is at the top of the sensitive length of the detector or at the top of the active length of the source, whichever is lower.

### Bottom of Range

For a fan source, the bottom of range is the point where a line drawn from the fan source to the detector centerline at the bottom end of the detector's sensitive length intersects the inner vessel wall nearest the detector. This is illustrated in [Figure 3–5](#).



**Tip** If the vertical beam width of the source does not fully illuminate the sensitive length of the detector, the bottom of the range is the point at which the lower limit of the source beam intersects the inner vessel wall. ▲

For a strip source, the bottom of the range is at the bottom of the detector's sensitive length or at the bottom of the active length of the source, whichever is higher.

In [Figure 3–5](#), the top of the source beam (center of the source housing) is aligned with the top of the sensitive length of the detector. Thus, the top of the measurable range is defined by the horizontal line drawn from the top of the sensitive length of the detector to the center of the source housing.

The bottom of the range (BR), measured from the top of the measurable range, is provided by the formula:

$$BR = BD - [PD \times BD \div SD],$$

or, equivalently,

$$BR = BD \times [1 - (PD \div SD)],$$

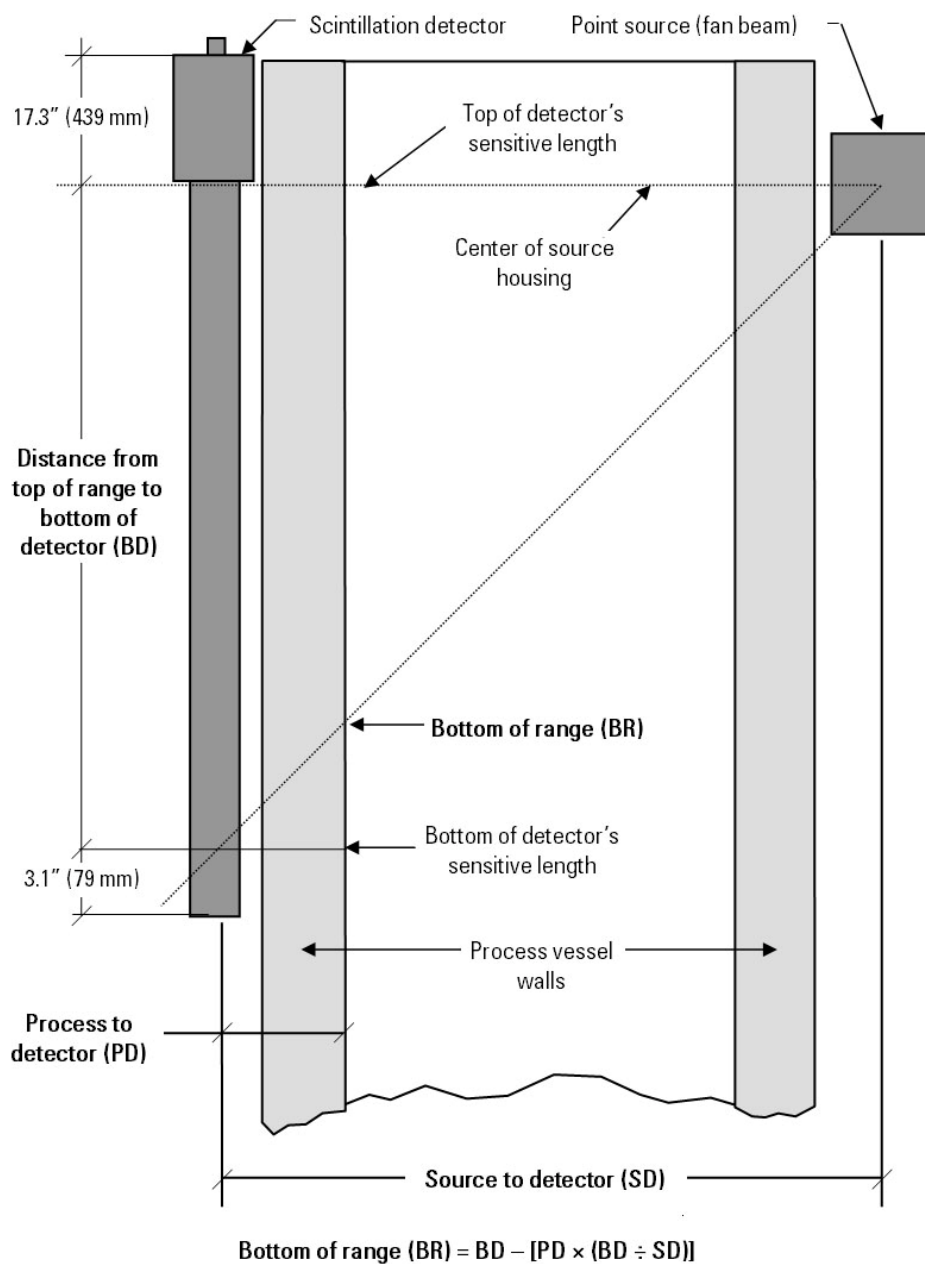
(continued)

where

BD = distance from top of range to the bottom of the sensitive length of the detector (in Figure 3–4, BD = sensitive length of detector).

PD = distance from the center of the detector to the inner vessel wall.

SD = distance from the center of the detector to the center of the source.



**Figure 3–5.** Scintillation detector with point source (fan beam)

## The Source



**Warning** In the United States, you may uncrate and mount the source housing, but you may not remove the shipping bolt unless you are licensed to commission the gauge. In Canada, you must have a license condition permitting mounting / dismantling, and without this condition, users may not remove the source from the shipping crate. ▲



**Warning** Use proper lifting procedures to avoid injury. ▲

The scintillation detector can be used with either a fan source or a strip source. Normally the scintillation detector is mounted so that the top of the detector's sensitive length is even with the top of the fan beam or even with the top of the active length of the strip source.

### Fan Source Guidelines

Note the following if using a fan source.

1. The vertical angle of the fan source beam is typically 45°. This means that the beam's vertical range is equal to the horizontal distance between the detector and the source. (In special cases, the angle may be 30° or 60°. [Contact Thermo Fisher](#) for guidance.)
2. Mount the source so that the top of the fan beam is aligned with the top of the sensitive length of the detector.
3. Install the source housing with its mounting face as close to the process vessel as practical, with no structural material (mounting tabs, brackets, etc.) between the beam area and the vessel.
4. The mounting should ensure accurate beam alignment with the detector and provide for easy left-right angular adjustment. The top of the beam should be even with the top of the measurable range.



## **Strip Source Guidelines**

Note the following if using a strip source.

1. Refer to the source housing drawings to determine the position of the active length of the strip source and other mounting dimensions.
2. Secure the housing with the 1/2-inch (12 mm) bolts and lock washers (six places). The housing mounting face allows clearance for bolts or studs extending up to 2-1/4 inches (57 mm) from the mounting surface.
3. For best results, the measurable range should be less than the active length of the strip source(s). Position the strip source so that the bottom of the active length of the source is even with the minimum level to be measured. If the measurable range must be greater than the active length of the strip source, position the top of the active length of the source so that it is even with the maximum level to be measured.
4. The mounting surface should be vertical. The mounting should ensure accurate beam alignment with the detector and provide for easy left-right angular adjustment.
5. Install the source housing with its mounting face as close to the vessel as practical, with no structural material (mounting tabs, brackets, etc.) between the beam area and the vessel.

## **Shutter Actuator**

If your source housing includes a pneumatic shutter actuator, refer to drawing [866664](#) for installation details.

## Multiple Detectors and / or Source Heads

Certain applications may require the use of multiple detectors and / or multiple source heads to span the desired measurable range.

If multiple detectors are used, the uppermost unit should be mounted so that the top of its sensitive length is even with the top of the measurable range. The remaining units should be mounted so that the top of each detector's sensitive length is aligned with or slightly overlaps the bottom of the sensitive length of the detector mounted just above it.

If more than one source head is required, the top source housing should be installed with the top of its beam even with the top of the desired measurable range. The other source housings should be spaced evenly along the vertical dimension of the vessel. For example, if the range of interest is 12 feet and three fan beam sources are used, the source housings should be spaced four feet apart.

The installation / arrangement drawings provide mounting dimensions for several fan source-detector configurations (refer to drawings [868566](#) through [868571](#)).

When mounting two or more pairs of strip sources and detectors on a small diameter tank, adjacent pairs of sources and detectors may be rotated by 90° if necessary. The source and detector for each source-detector pair at the same height must still be mounted on opposite sides of the tank (180°). After mounting the uppermost source-detector pair, the position of the source and detector in the next lower pair may be rotated by 90° and so on.

# Chapter 4

## Wiring

### Overview

Wiring should be performed in the following order:

1. Power to the gauge
2. Remote computer terminal or handheld terminal to the gauge via the serial communication ports
3. Optional wiring:
  - a. 4–20 mA current output
  - b. Relay contacts
  - c. Contact closure inputs
  - d. Remote display
  - e. Auxiliary 4–20 mA current input
  - f. Wiring to cascade multiple units

### Preparation

Review the following carefully prior to connecting any wiring.



**Warning** Remove all power from the unit before making any connections. Electrocutation can result if power is present. ▲



**Warning** All wiring must be done by qualified individuals in accordance with applicable codes such as the NEC (National Electric Code) ANSI / NFPA 70 specifications or the Canadian Electrical Code Part 1. ▲



**Warning** Do not apply power to the unit in any hazardous area unless the safety ground is properly wired inside the unit and the cover is properly installed. ▲



**Warning** For hazardous location installations, the cable entries must be sealed per the [installation layout drawing \(868502\)](#). ▲



**Warning** For non-hazardous location installations, the cable entries into the enclosure must be sealed with a compound to protect against the passage of gas or vapors. The sealing compound should not be affected by the surrounding atmosphere or liquids. The sealing compound must have a thickness of at least 5/8 inch (16 mm). ▲



**Warning** If metal conduit is used, the conduit must be grounded. ▲



**Warning** Connect the AC wiring earth ground to the internal safety ground terminal, as shown in the wiring diagram. Refer to “[Optional AC Power](#)” later in this chapter to change the AC supply voltage. ▲

## Wiring Drawings

The [installation layout drawing \(868502\)](#) provides general guidance for routing the cables to the unit. The [installation wiring drawing \(868503\)](#) shows the function of each connector pin on the CPU board and optional AC power / relay board. In addition, the drawing shows cable requirements for connecting the sensor to the transmitter, power requirements, and grounding locations.

The label on the top of the detector-transmitter chassis also shows connector pin information for wiring the power boards, including the relay contacts, the contact closure inputs, and the current output. Drawing [868519](#) provides additional instructions for wiring the RS485 and RS232 serial port connectors.

## General Procedure

Follow this general procedure to access the detector electronics for wiring.

1. Ensure all source shutters are in the OFF position.
2. Ensure all power to the gauge is turned off.
3. Remove the housing access cover by loosening the screw on the cover retaining bracket and sliding the bracket off of the housing cover. Unscrew the housing access cover. Two lugs on the top of the cover aid with removal.

4. Remove the cable conduit plugs from the hole(s) that will be used. As shown in the [installation layout drawing \(868502\)](#), lay one conduit for the DC power input and signal cables and a second conduit for the AC power input and relays, if applicable. Route the cables into the detector housing and connect input power and signal wires as shown in the [wiring drawing \(868503\)](#).
5. Pull each cable through the correct conduit fitting and into the enclosure. Leave approximately 6 inches (150 mm) for strain relief. Secure the conduit, making sure it is completely sealed.
6. Continue through the remaining sections in this chapter for wiring instructions specific to the power supply, serial and HART® communications, etc.
7. When the wiring is complete, replace the detector housing cover, and secure the cover retaining bracket.

## CPU Board

The CPU board is the system's main board. The gauge is shipped from the factory with all CPU board jumpers configured properly for your system configuration. Should you need to replace the CPU board, note the jumper settings for connectors J7 (current output configuration) and J11 (system configuration) before replacing the board. After installing the new board, verify that the jumpers are set properly for your system configuration. [Figure 4–1](#) shows the location of connectors and jumpers.

## System Configuration

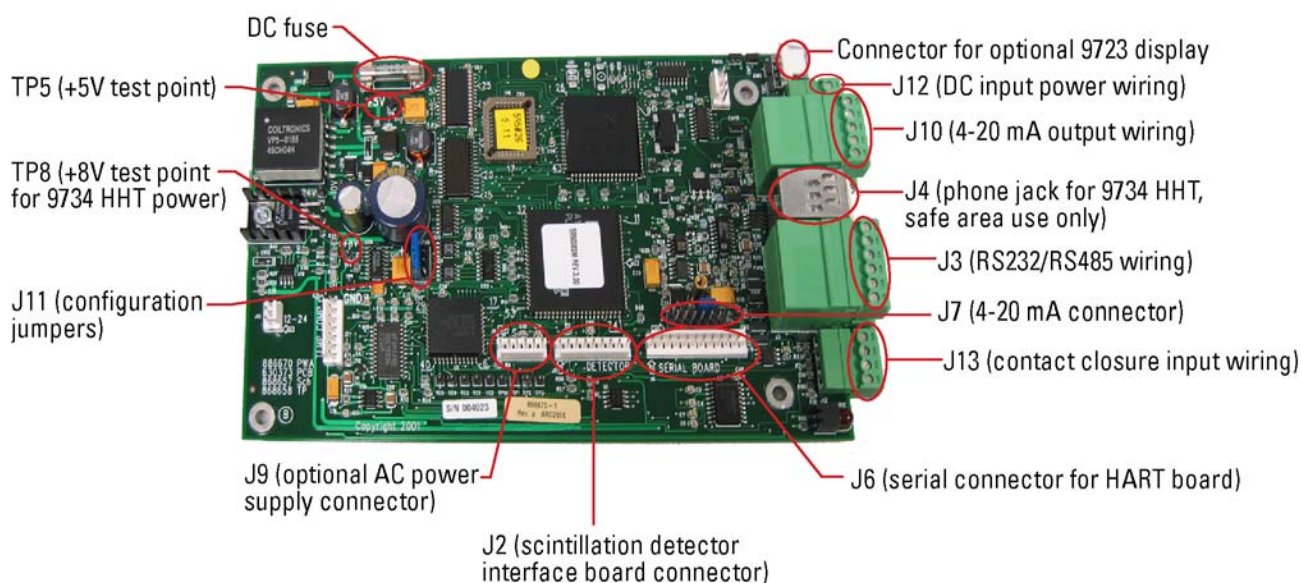
J11 on the CPU board is the connector for system configuration jumpers. Move the jumper at pins 5 and 6 to pins 4 and 5 to enable the CPU to recognize optional relays mounted on the power supply board. Later units will be shipped with the jumper already at pins 4 and 5, even if the relay option is not purchased.

Move the jumper to pins 1 and 8 of the J11 connector to erase system memory.



**Caution** Placing a jumper across pins 1 and 8 on the J11 connector erases system memory. All user-entered parameters are erased and reset to factory defaults. ▲

If you are going to erase memory by placing a jumper across pins 1 and 8, first remove power from the detector-transmitter. Note the location of the jumpers on the J11 connector. Place a jumper across pins 1 and 8, apply power, and leave power on for approximately 30 seconds to erase memory. Remove power and restore the configuration jumpers to their original settings.



**Figure 4-1.** Connectors and jumpers on the CPU board

## Power Supply

The system is designed to operate on 24 Vdc. If the optional AC power board is installed, the system can also operate on 115 or 230 Vac ( $\pm 15\%$ ), 50/60 Hz. The maximum input power requirement is 12 VA. If both AC and DC power are supplied to the detector, the detector will draw power from whichever source provides the higher DC voltage.

The maximum length of the cable that can be used to supply power varies depending on the wire gauge. Refer to the [wiring drawing \(868503\)](#) for cable information and other wiring details.



**Warning** All wiring must be done by qualified individuals in accordance with applicable codes such as the NEC (National Electric Code) ANSI / NFPA 70 specifications or the Canadian Electrical Code Part 1. For intrinsically safe systems, refer to ANSI / ISA RP 12.6. ▲



**Note** To meet the requirements of CSA 1010.1, an external switch or circuit breaker must be installed to allow the power source to be disconnected from the gauge. In addition, protective bonding (grounding) must always be provided, even if DC power is used. ▲

## DC Power

J12 on the CPU board is the connector for the DC source voltage wiring. Refer to the [wiring drawing \(868503\)](#) and to the table below for connections.

**Table 4–1.** DC power connections

Power Supply	J12 on CPU Board
Positive (+)	J12-2
Negative (-)	J12-1



**Note** To meet the requirements of CSA 1010.1, the input DC terminals must be supplied from a SELV (Safety Extra Low Voltage) source. ▲

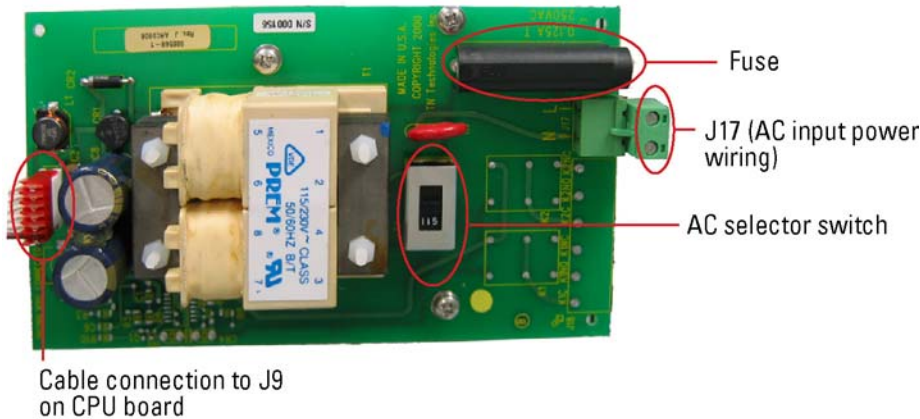
## Optional AC Power

If the optional AC power board is installed, the gauge may be operated using 115 or 230 Vac. The AC selector switch is shown in the figure below.



**Caution** Applying 230 Vac with the selector switch in the 115 Vac position will damage the equipment. ▲

J9 on the CPU board is the connector for the AC power supply, and J17 on the AC power supply is the wiring connector. Refer to the [wiring drawing \(868503\)](#) and to the figure below.



**Figure 4–2.** AC power supply board



**Caution** For reliable operation and to maintain safety approval, the F1 fuse on the AC power board must only be replaced with an approved fuse. ▲



**Warning** Remove all power from the unit before making any connections. Electrocutation can result if power is present. ▲

### Relays

The AC power supply can be purchased with two relays. Relay contacts are Form C SPDT, isolated 8 A, 220 Vac. The relays can be configured to open or close on events or faults or with level measurement. Refer to the LevelPRO user manual for instructions.

Refer to the [wiring drawing \(868503\)](#) and the label inside the transmitter cover for wiring details.

## Serial Communications

The gauge provides one RS232 single drop and one RS485 multi-drop serial interface. Screw terminal connectors for both ports are located at J3 on the CPU board.

The RS485 connector includes the +8 Vdc required to power the Thermo Scientific 9734 handheld terminal (HHT) as well as the +DATA and –DATA connections. An RJ11 (phone jack) connector is also provided for the RS485 port at J4 on the CPU board. The HHT can be connected directly to the RJ11 connector in safe areas.

Both ports provide independent access to the measurement readings and software functions. They are always active and can be used to display measurements. The setup menus, however, may only be accessed by one port at a time.

### RS485 Wiring

Connecting the serial (COM) port on a PC to the RS485 port on the gauge requires a RS485 / RS232 converter (P/N OTO515D).

1. Connect J3-12 (+DATA) and J3-11 (–DATA) to the corresponding connections on the RS485 / RS232 converter.
2. Connect the converter to the PC using the supplied DB9 serial cable.
3. Refer to drawings [868519](#) and [868503](#) for additional details.



## Initial Setup for Party-Line Communications

To communicate with multiple gauges via a RS485 party-line, each unit must be assigned a unique unit identification number so it can be addressed individually. All gauges are assigned unit number 0 (zero) by default.

To assign a unique unit number to each gauge, you must be able to communicate with each one individually. Disconnect each gauge from the party-line in turn and communicate with the disconnected gauge directly. Alternately, you can remove power from all gauges except one and assign a unit number to the powered gauge.

If you have trouble using another device on the RS485 chain, verify that it is properly terminated for its position on the chain. To terminate a device, connect a 120-ohm resistor between its RS485 + / - data terminals. Never terminate more than the first and last device in the chain.

## RS232 Wiring

The serial port on a PC (COM1 or COM2) can be connected directly to the RS232 port on the gauge. This requires five wires: ground, transmit (TX), receive (RX), request-to-send (RTS), and clear-to-send (CTS). The connections between the RS232 port (J3 on the CPU board) and the PC serial port are summarized in the table below for standard DB9 and DB25 PC serial port connectors.

**Table 4-1.**

J3 on CPU Board	PC Serial Port DB9 Connector	PC Serial Port DB25 Connector
J3-2 (RX)	Pin 3	Pin 2
J3-3 (TX)	Pin 2	Pin 3
J3-4 (RTS)	Pin 8	Pin 5
J3-5 (CTS)	Pin 7	Pin 4
J3-6 (GND)	Pin 5	Pin 7

## Using Serial Communications

To communicate with the gauge from a PC requires that the PC be running a terminal emulation software. The default communication settings for the gauge's RS485 and RS232 ports and for the HHT are: 7 data bits, Even parity, 1 stop bit, 9600 baud.

Refer to the LevelPRO user guide for additional details about setting up and using serial communications.

## HART Communications

The HART® communication protocol is supported over the 4–20 mA current output with the HART interface board. The HART interface board is an optional daughter board that is wired via a cable to J6 on the CPU board. Communication with the gauge is via the 275 or 375 Field Communicator from Emerson Electric Co. Refer to the LevelPRO HART operation manual (P/N 717817) for detailed instructions.



**Tip** HART communication protocol allows you to configure and calibrate the gauge in most applications; however, due to limitations of the protocol, the complete range of functions are only available when using the Thermo Scientific Model 9734 handheld terminal and the RS485 port. ▲

## Contact Closure Inputs

The contact closure inputs are dry contact inputs between ground and Switch 1 and ground and Switch 2 at J13 on the CPU board. The gauge can be configured via software settings to execute a command or other function upon a user-provided contact opening or closing. Refer to the LevelPRO user manual for instructions on assigning commands to the contact closure inputs.

When operating in “cascade” mode, where multiple units are wired together to act as a single detector, contact closure Switch 2 is dedicated to performing the cascading function. Refer to drawings [868503](#) and [868529](#).

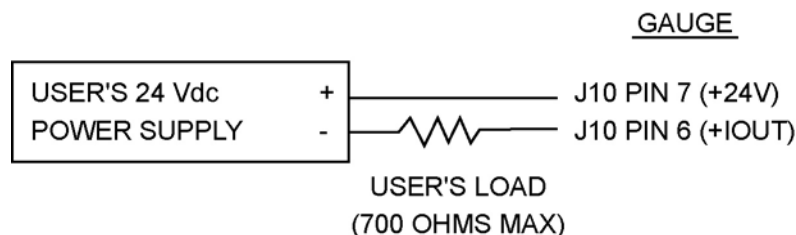
## Current Output

Following are the configurations available for the 4–20 mA current output:

- Isolated, loop-powered (default)
- Non-isolated, self-powered
- Isolated, self-powered output (requires optional piggyback board P/N 886595)

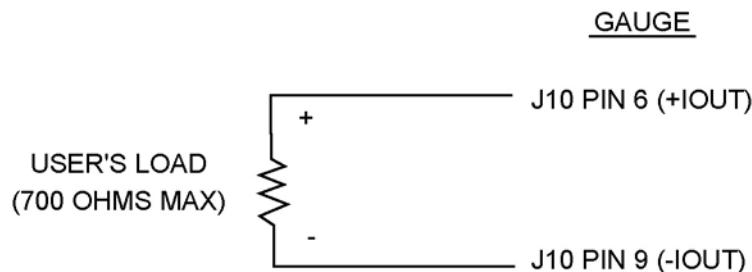
The isolated, loop-powered or non-isolated, self-powered configurations can drive a 700 ohm maximum load over the full current output range. The isolated, self-powered current output can drive a maximum load of 1000 ohms. The current output is programmable between 0 and 20 mA. The operational range of the output current is 3.8–20.5 mA. The fault low condition for the current output is 3.6 mA or less, and the fault high condition is 20.8 mA or greater.

The default current output configuration is isolated, loop-powered. A jumper is placed across pins 4 and 5 of the J7 connector on the CPU board. For this configuration, pins 6 and 7 of the J10 connector are for the 4–20 mA output connections.



**Figure 4–3.** 4–20 mA loop powered configuration

To configure the current output as non-isolated, self-powered, move the jumper to pins 3 and 4 of the J7 connector. For this configuration, pins 6 and 9 of the J10 connector are for the 4–20 mA output connections.



**Figure 4–4.** 4–20 mA non-isolated, self-powered configuration

To configure the current output as isolated, self-powered, a piggy-back board must be installed on the J7 connector (no jumpers used). For this configuration, pins 6 and 8 of the J10 connector are for the 4–20 mA output connections.

## Cascade Mode Wiring

For applications requiring a detector length greater than twelve feet, multiple units can be wired together to act as one continuous detector. In this situation, the last unit in the line is referred to as the primary unit. All wiring for the serial ports, relays, etc. is done in the primary unit. Remaining units are referred to as secondary units. All secondary units must be powered in the same manner as the primary unit (either AC or DC). Each secondary unit must be wired such that the cascade “out” from one goes into the cascade “in” of the next unit in line. These totaled signals are accumulated in the primary unit, which outputs the actual level indication. All programming for secondary units must be set at default conditions for the cascade to work properly.

Refer to drawings [868503](#) and [868529](#) in the drawing appendix for the wiring requirements.

## Auxiliary Input Wiring

There is an auxiliary connection on connector J10 for applications requiring an outside 4–20 mA signal be input into the LevelPRO and used as a form of compensation adjustment (vapor density, pressure, etc.). The outside 4–20 mA signal should be wired so that the positive connection of the loop is connected at J10 pin 1 and the negative side connected to J10 pin 2. The special equation is then utilized to incorporate this input into the LevelPRO program. Refer to the LevelPRO user guide for information on special equations.

# Chapter 5

## Service & Support

### Getting Help

The local representative is your first contact for support and is well equipped to answer questions and provide application assistance. You can also obtain support by contacting Thermo Fisher directly.

#### In the United States

Thermo Fisher Scientific  
1410 Gillingham Lane  
Sugar Land, TX 77478  
Phone: 713-272-0404  
Fax: 713-272-2272

#### In Canada

Thermo Fisher Scientific  
14 Gormley Industrial Avenue  
Gormley, Ontario  
L0H 1G0  
Phone: 905-888-8808  
Fax: 905-888-8828

#### In Europe

Thermo Fisher Scientific  
Ion Path  
Road Three  
Winsford  
Cheshire CW7 3GA  
United Kingdom  
Phone: +44 (0) 1606 548700

#### On the Web

[www.thermo.com](http://www.thermo.com)

### Warranty

Thermo Scientific products are warranted to be free from defects in material and workmanship at the time of shipment and for one year thereafter. Any claimed defects in Thermo Scientific products must be reported within the warranty period. Thermo Fisher Scientific Inc. (Thermo Fisher) shall have the right to inspect such products at Buyer's plant or to require Buyer to return such products to Thermo Fisher plant.

In the event Thermo Fisher requests return of its products, Buyer shall ship with transportation charges paid by the Buyer to Thermo Fisher plant. Shipment of repaired or replacement goods from Thermo Fisher plant shall be F.O.B. Thermo Fisher plant. A quotation of proposed work will be sent to the customer. Thermo Fisher shall be liable only to replace or repair, at its option, free of charge, products which are found by Thermo Fisher to be defective in material or workmanship, and which are reported to Thermo

Fisher within the warranty period as provided above. This right to replacement shall be Buyer's exclusive remedy against Thermo Fisher.

Thermo Fisher shall not be liable for labor charges or other losses or damages of any kind or description, including but not limited to, incidental, special or consequential damages caused by defective products. This warranty shall be void if recommendations provided by Thermo Fisher or its Sales Representatives are not followed concerning methods of operation, usage and storage or exposure to harsh conditions.

Materials and / or products furnished to Thermo Fisher by other suppliers shall carry no warranty except such suppliers' warranties as to materials and workmanship. Thermo Fisher disclaims all warranties, expressed or implied, with respect to such products.

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# Appendix A

## Ordering Information

A complete LevelPRO system consists of up to four integrated detector-transmitters, any number of sources as applicable to the application, and a type of communication.

**Table A–1.** System ordering information

Code	Model
LPRO	LevelPRO integrated continuous nuclear / gamma level system
Code	Detector-Transmitter Enclosure Type
S	Carbon steel detector housing
W	Water-cooled jacketed steel detector housing
Code	First Detector-Transmitter Length*
01	1 ft detector
02	2 ft detector
04	4 ft detector
06	6 ft detector
08	8 ft detector
10	10 ft detector
12	12 ft detector
Code	Second Detector-Transmitter Length (optional)*
XX	XX ft detector (same lengths available as first detector-transmitter)
Code	Third Detector-Transmitter Length (optional)*
XX	XX ft detector (same lengths available as first detector-transmitter)
Code	Fourth Detector-Transmitter Length (optional)*
XX	XX ft detector (same lengths available as first detector-transmitter)
Code	Input Power
A	115 Vac
B	24 Vdc
C	230 Vac

**System ordering information, cont.**

<b>Code</b>	<b>Relay Output</b>
N	No relay
R	Two SPDT relays
<b>Code</b>	<b>4–20 mA Output Type</b>
L	Isolated, loop-powered
S	Isolated, self-powered
N	Non-isolated, self-powered
<b>Code</b>	<b>Communications</b>
0	No selection
A	9734 HHT RS485 cable
B	9734 HHT RS485 & RS232 cable
C	RS485 / RS232 converter
E	HART communication module
<b>Code</b>	<b>Accessories (optional)</b>
S	Sm SS tag (0.75 x 2.5 in), wired
L	Lg SS tag (3.3 x 2.5 in), wired
R	RJ11 modular connector jack
D	Model 9723 backlit LCD
A	3/4-in NPT to metric adapter

\*Detector-transmitter lengths available in odd increments (3 ft, 5, ft, etc.) as a special order. [Contact Thermo Fisher](#) for details.

**Table A–2.** Spare parts

<b>Part Number</b>	<b>Description</b>
88670-1	CPU board
886592	Detector board
886595-1	ISO-24 piggyback board. Supports isolated, self-powered current output.
886568-1	AC power board, no relays.
886568-2	AC power board, 2 relays.
886568-3	Board with 2 relays, no AC power.
	AC power board fuse, F1 (Littelfuse 313.125), 250V, 0.125A (1/8A), Type T (SB), Size 3AG.



# Appendix B

## Specifications

Results may vary under different operating conditions.

**Table B–1.** Performance specifications

System Performance	0.5% of span, typical
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**Table B–2.** Gamma ray source

Source Type	Cs-137 or Co-60, both stainless steel doubly encapsulated
Size	10–10,000 mCi Cs-137 or 1,000–2,000 mCi Co-60 (source size dependent upon application)
Source Housing	Carbon steel, lead filled, polyurethane painted (stainless steel also available) Two-position shutter, locks in OFF (closed) position 30°, 45°, and 60° beam angle source housings available (beam angle is dependent upon application)

**Table B–3.** Integrated detector-transmitter

System Architecture	Multiprocessor based electronics provides uninterrupted output during data entry and system interrogation Surface mount technology provides high degree of reliability All user data is doubly stored in non-volatile memory with no battery backup required
Detection Type	PVT plastic scintillator with wide dynamic range; PVT resists shock and moisture damage
Detector Lengths	Standard detector lengths in 2-ft increments, up to 12 ft* Multiple detectors can be wired together for large measurement spans.
Power	115/230 Vac $\pm$ 10%; 50/60 Hz or 24 Vdc available Surge protected 9–35 Vdc
Operating Temperature	-40°C to +60°C (-40°F to +140°F), ambient

**Integrated detector-transmitter, cont.**

Enclosure Construction	Carbon steel polyurethane painted Optional water-cooled detector for higher temperature applications
Approvals	FMRC approved Class I, Div. 1, Groups B, C, & D; dust-ignition proof in Class II, Div. 1, Groups E, F, & G; suitable for Class III, Div. 1 hazardous locations; indoor and outdoor NEMA 4  CSA approved Class I, Div. 1, Groups B, C, & D; dust-ignition proof in Class II, Div. 1, Groups E, F, & G; suitable for Class III, Div. 1 hazardous locations; indoor and outdoor CSA ENCL 4  Intertek ATEX approved II 2 G Ex d IIC T6 IP66 CE Mark

\*Detector-transmitter lengths available in odd increments (3 ft, 5, ft, etc.) as a special order. [Contact Thermo Fisher](#) for details.

**Table B–4.** Outputs / Inputs

Current Outputs	Standard: 4–20 mA isolated, loop-powered into 800 ohms, field scalable Optional: 4–20 mA isolated, self-powered into 800 ohms, field scalable Optional: 4–20 mA non-isolated, self-powered into 800 ohms, field scalable
Serial Outputs	RS485 half-duplex, RS232 full duplex
Contact Closure Outputs	2X 115 Vac / 28 Vdc SPDT at 10 A (230 Vac SPDT at 8 A)
Inputs	Signal from another LevelPRO detector; additional input for gas density compensation or buildup available Dry contact closure

**Table B–5.** Mounting Hardware

Integrated detector-transmitter	Integral bolt-on bracket
Gamma ray source	Integral bolt-on bracket

**Table B–6.** Local remote display

Model 9723	<p>2-line x 16-character backlit LCD</p> <p>Hazardous enclosure is FMRC and CSA approved for Class I, Div. 1, Groups E, F, &amp; G; Class III, Div. 1, hazardous locations. FMRC approved NEMA 4 and CSA TYPE 4</p> <p>Display powered from electronics</p> <p>Maximum separation from electronics: 300 ft (91.4 m)</p>
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**Table B–7.** Programming

375 Field Communicator	<p>For setting up and calibrating the gauge and for entering data. Communicates with any LevelPRO via the current loop. BEL202FSK standard</p>
Handheld Terminal (Model 9734)	<p>For setting up and calibrating the gauge and for entering data. Communicates with any LevelPRO via RS485 connector. Provides upload / download of gauge configuration to / from PC via RS232 interface.</p>
Comm PC Interface Software	<p>For interfacing with up to 32 LevelPRO units over RS485; RS485 / RS232 converter provided</p>

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## Appendix C

# Drawings



**Note** Information presented in this chapter has been regenerated from original drawings. Every effort is made to maintain document accuracy. However, in order to enhance legibility, the documents may have been restructured and some information may have been intentionally excluded. Therefore, the drawings within this manual may not be exact duplicates of the original drawings. ▲



**Note** Drawings in this manual are included for reference only and may not be the current version. [Contact the factory](#) if you need a copy of the latest revision. ▲

**Table C–1.** Wiring

Drawing	Rev.	Description	Page
868503	E	Installation wiring – LevelPRO Model 9740A-X (3 sheets)	<a href="#">C–3</a>
868519	B	RS485 installation & wiring (1 sheet)	<a href="#">C–6</a>
868529	A	Multiple detectors cascade wiring, Models 9742/4/6 (1 sheet)	<a href="#">C–7</a>
867627	C	Installation drawing – Local / remote display, Model 9723 (1 sheet)	<a href="#">C–8</a>

**Table C–2.** Mechanical

Drawing	Rev.	Description	Page
868502	C	Installation layout – LevelPRO Model 9740A-X (1 sheet)	<a href="#">C–9</a>
868672	B	Mounting dimensions – LevelPRO Model 9740A-X (1 sheet)	<a href="#">C–10</a>
868674	A	Mounting dimensions – LevelPRO water-cooled Model 9740A-X (1 sheet)	<a href="#">C–11</a>
868568	B	LevelPRO installation / arrangement drawing – 1 source with 1 detector (2 sheets)	<a href="#">C–12</a>
868569	B	LevelPRO installation / arrangement drawing – 2 sources with 1 detector (2 sheets)	<a href="#">C–14</a>
868566	B	LevelPRO installation / arrangement drawing – 3 sources with 1 detector (2 sheets)	<a href="#">C–16</a>
868567	B	LevelPRO installation / arrangement drawing – 2 sources with 2 detectors (2 sheets)	<a href="#">C–18</a>

Drawing	Rev.	Description	Page
868570	B	LevelPRO installation / arrangement drawing – 2 sources with 3 detectors (2 sheets)	C-20
868571	B	LevelPRO installation / arrangement drawing – 3 sources with 2 detectors (2 sheets)	C-22

**Table C-3.** Source housings

Drawing	Rev.	Description	Page
865494	C	Mounting dimensions – Model 5205 / 5205A source housing, 100 mCi (1 sheet)	C-24
865504	B	Mounting dimensions – Model 5206 source housing, 500 mCi (1 sheet)	C-25
865514	C	Mounting dimensions – Model 5207 source housing, 2000 mCi (1 sheet)	C-26
865524	D	Mounting dimensions – Model 5208 source housing, 8000 mCi (1 sheet)	C-27
866891	A	Mounting dimensions – Model 5210 source housing, 10 Ci Cs-137, 3 Ci Co-60 (1 sheet)	C-28
868628	B	Mounting dimensions – Model 5205B source housing (1 sheet)	C-29
868629	B	Mounting dimensions – Model 5206B source housing (1 sheet)	C-30
868630	B	Mounting dimensions – Model 5207B source housing (1 sheet)	C-31
868631	C	Mounting dimensions – Model 5208B source housing (1 sheet)	C-32
860463	B	Mounting dimensions – Model 5194 strip source, 1 ft., 500 mCi (1 sheet)	C-33
860473	C	Mounting dimensions – Model 5195 strip source, 2 ft., 1000 mCi (1 sheet)	C-34
860483	C	Mounting dimensions – Model 5196 strip source, 3 ft., 1000 mCi (1 sheet)	C-35

**Table C-4.** Source housing options

Drawing	Rev.	Description	Page
866764	--	Interlock option for Models 5205–5208 source heads (1 sheet)	C-36
866664	B	Pneumatic actuator and position switch for Models 5205–5208 (1 sheet)	C-37
867269	B	Mounting instructions – Remote manual actuator for Models 5205–5208 (2 sheets)	C-38

**Table C-5.** Other

Drawing	Rev.	Description	Page
868709	B	HART retrofit, LevelPRO (1 sheet)	C-40

- GENERAL WIRING REQUIREMENTS:
- A1. INSTALLATION SHOULD BE IN ACCORDANCE WITH ANSI/ISA RP12.6 AND THE NEC ANSI/NFPA 70, OR (CANADA) ACCORDING TO THE APPLICABLE REQUIREMENTS OF THE CANADIAN ELECTRICAL CODE PART 1.
- A2. ALL WIRING REQUIRES A MINIMUM INSULATION RATING OF 85°C.
- A3. MOST OF THE WIRING IS OPTIONAL; WITH THE EXCEPTION THAT AT LEAST ONE OF THE FOLLOWING INPUT POWER OPTIONS MUST BE APPLIED:
- A. +24Vdc ± 20%
  - B. 115 OR 230 VAC (REQUIRES AN OPTIONAL PWA.)
- A4. SHIELDED CABLES MUST BE USED FOR ALL WIRING TO THE CPU (PROCESSOR BOARD).
- A5. REFER TO DRAWING NO. 888529 PRIOR TO WIRING A MULTIPLE DETECTOR SYSTEM CONFIGURATION.
- A6. **NON-HAZARDOUS LOCATIONS:**  
THE CABLE ENTRIES INTO THE ENCLOSURE MUST BE SEALED WITH A COMPOUND TO PROTECT AGAINST THE PASSAGE OF GAS OR VAPORS. THE COMPOUND SHOULD NOT BE AFFECTED BY SURROUNDING ATMOSPHERE OR LIQUIDS. THE MINIMUM THICKNESS OF THE SEALING COMPOUND SHOULD BE 5/8 IN. [16mm].
- HAZARDOUS LOCATIONS:**  
THE CABLE ENTRIES INTO THE ENCLOSURE MUST BE SEALED PER THE INSTALLATION LAYOUT DRAWING (DRAWING NO. 888502).

**NOTES AND WIRING REQUIREMENTS FOR J10**

C1. USE 28-16 AWG WIRE.

C2. THE DEFAULT CONFIGURATION USED FOR THE 4-20mA IS AS AN ISOLATED LOOP-POWERED CONFIGURATION.  
THE USER APPLIES A +24Vdc INPUT TO J10-PIN 7.  
THE USER'S AMPMETER OR OTHER CURRENT MONITORING DEVICE CONNECTS AS FOLLOWS:  
  + TO J10-PIN 6 OF THE GAUGE  
  - TO THE RETURN OF THE USER'S +24Vdc SUPPLY.

C3. THE 4-20mA CAN BE RE-CONFIGURED AS A NON-ISOLATED SYSTEM-POWERED OUTPUT BY:  
MOVING THE JUMPER ON J7 OF THE CPU BOARD FROM PINS 4 AND 5 TO PINS 3 AND 4.  
IN THIS CONFIGURATION: J10 PIN 6 IS IOUT+ AND J10 PIN 9 IS IOUT-.

C4. THE 4-20mA CAN BE RE-CONFIGURED AS AN ISOLATED SYSTEM-POWERED OUTPUT BY:  
INSTALLING A PIGGY BACK BOARD (TN PIN 888595) TO THE J7 CONNECTOR ON THE CPU BOARD.  
IN THIS CONFIGURATION: J10 PIN 6 IS IOUT+ AND J10 PIN 8 IS IOUT-.

DESIGNATION	DESCRIPTION	MAX. VOLTAGE	MAX. CURRENT
PIN 1	+ AUX (INPUT)	5V	20mA
PIN 2	- AUX (INPUT)	5V	20mA
PIN 3	GND		
PIN 4	CASCADE OUT (CMOS PULSES) SEE DRAWING NO. 888529	5.3V OUT	< 1mA
PIN 5	CASCADE IN (CMOS PULSES) SEE DRAWING NO. 888529	5.3V IN	< 1mA
PIN 6	I Out +	+28V	20mA
PIN 7	+24V LOOP POWER IN	+28V	20mA
PIN 8	IOUT - (IF SELF-POWERED) SEE NOTE C4.	+28V	20mA
PIN 9	GND	N/A	N/A
PIN 10	Not Used	N/A	N/A

4-20mA

☐ LOOP-POWERED (DEFAULT)

☐ NON-ISOLATED SYSTEM-POWERED

☐ ISOLATED SYSTEM-POWERED

Figure C–1. 868503: Installation wiring – LevelPRO Model 9740A-X (sheet 1 of 3)

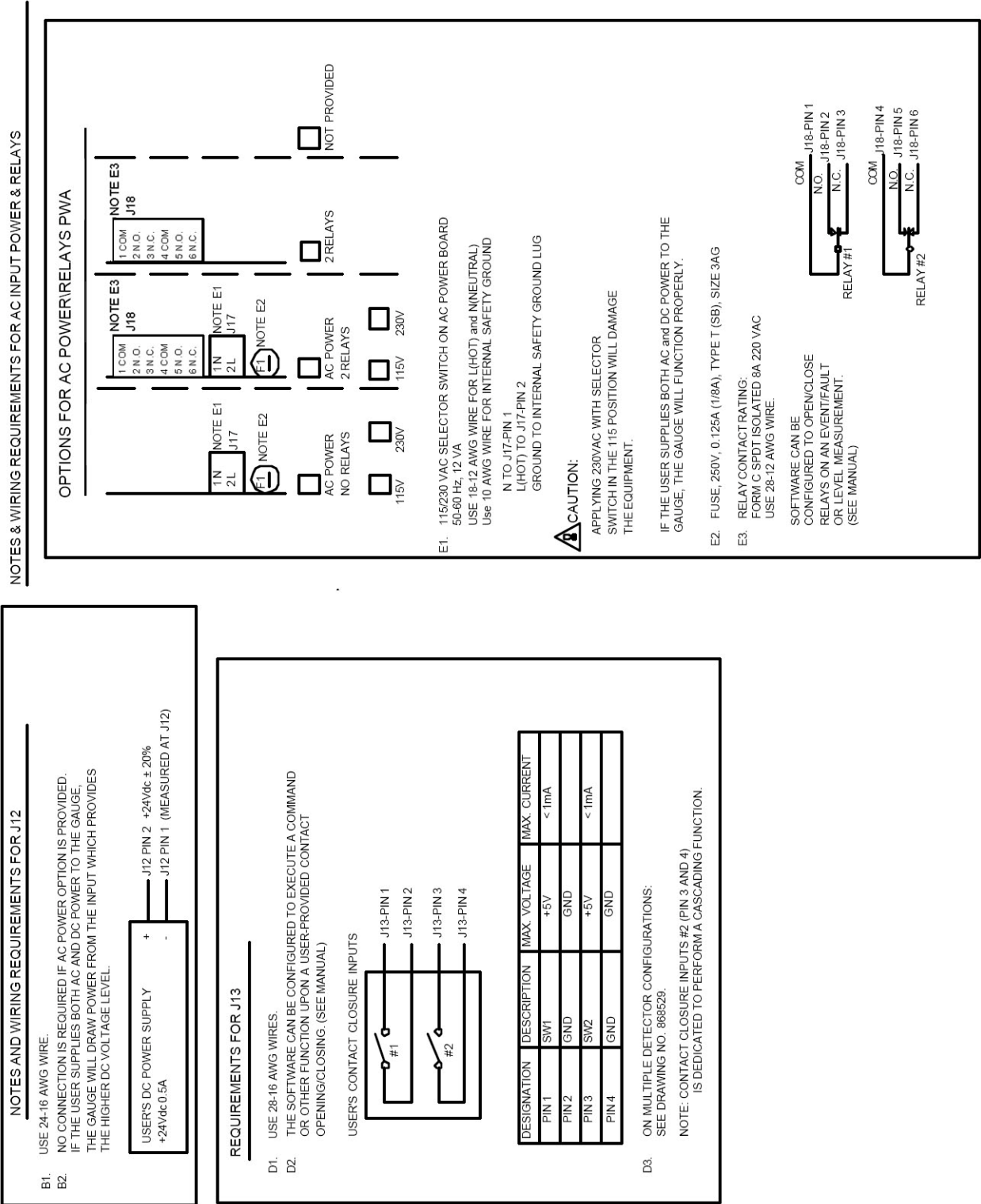
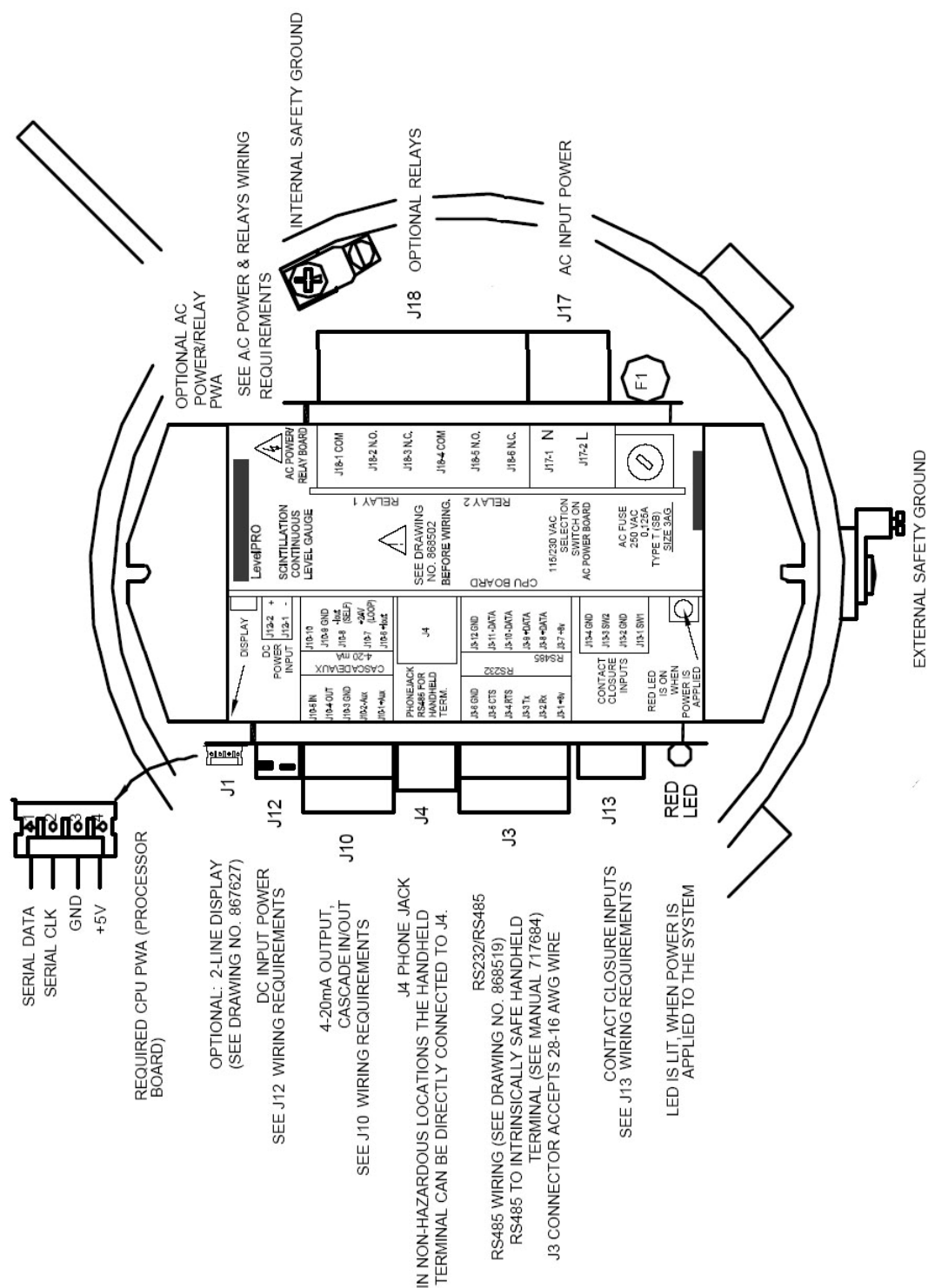
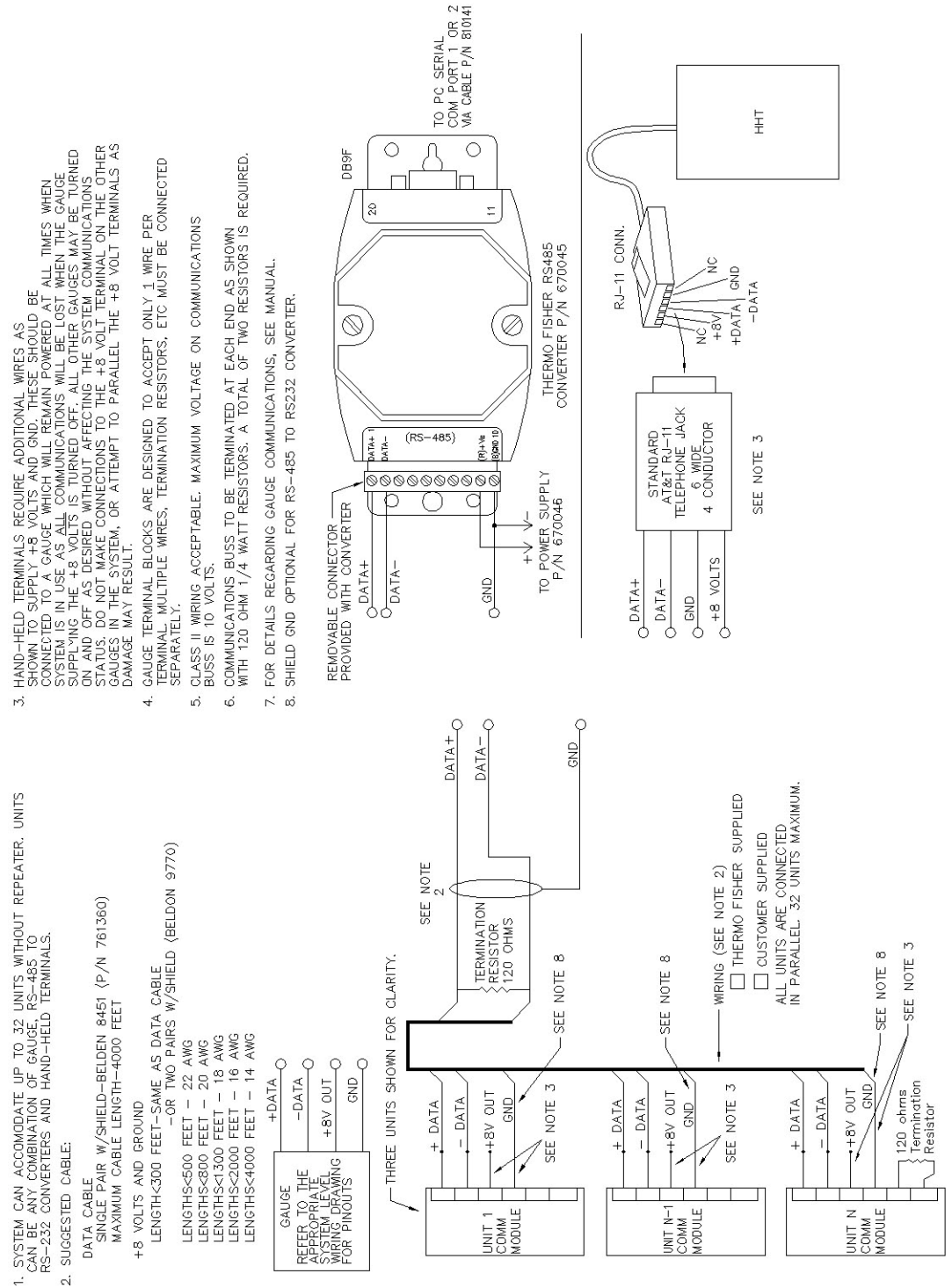


Figure C-2. 868503: Installation wiring – LevelPRO Model 9740A-X (sheet 2 of 3)





**Figure C–3.** 868503: Installation wiring – LevelPRO Model 9740A-X (sheet 3 of 3)



**Figure C-4.** 868519: RS485 installation & wiring (sheet 1 of 1)

NOTES:

1. FIGURE 1 SHOWS THE ADDITIONAL WIRING REQUIRED TO CASCADE TWO (2) OR MORE DETECTORS.
2. AC AND/OR DC POWER MUST BE APPLIED TO ALL DETECTORS PER DRAWING NO. 868503.
3. THE SAFETY GND MUST BE CONNECTED TO ALL DETECTORS PER DRAWING NO. 868503.
4. DETECTOR #1 CONTROLS THE OPERATION OF THE OTHER DETECTORS. ANY ADDITIONAL WIRING; SUCH AS: RS232/RS485 COMMUNICATION OR 4–20ma OUTPUT NEEDS TO BE WIRED TO DETECTOR #1 PER DRAWING NO. 868503.

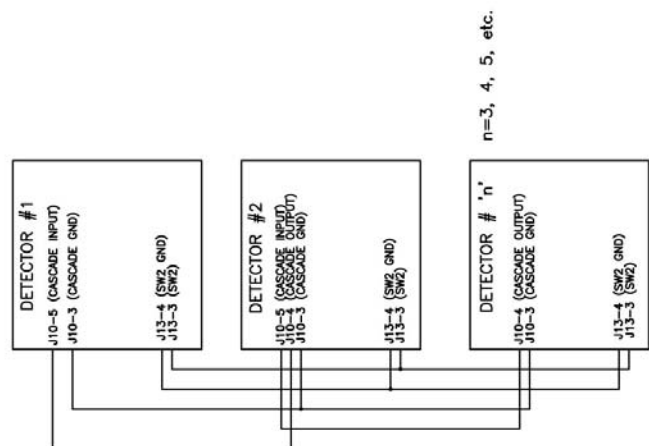
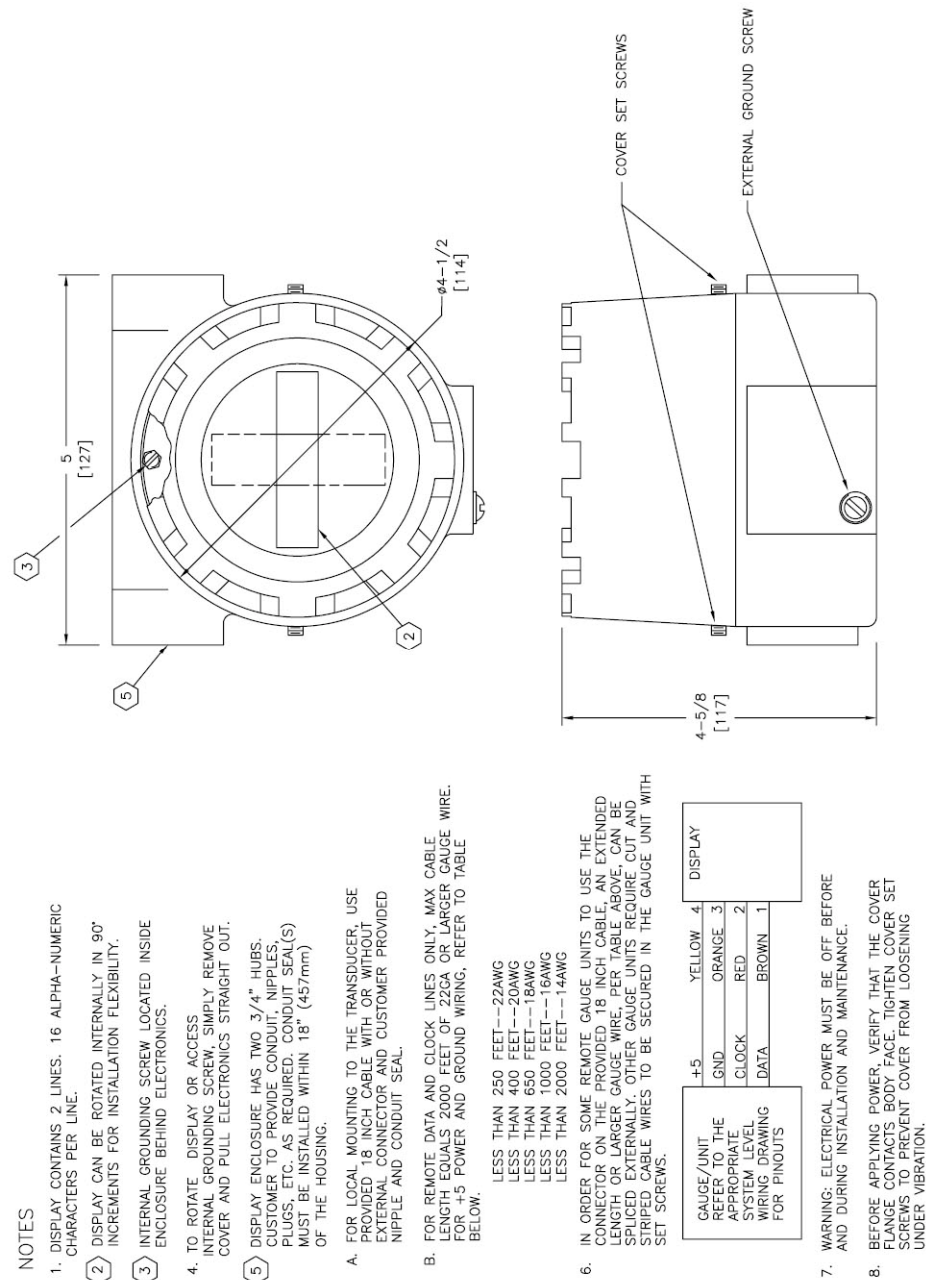


FIGURE 1

**Figure C–5.** 868529: Multiple detectors cascade wiring, Models 9742/4/6 (sheet 1 of 1)



**Figure C–6.** 867627: Installation drawing – Local / remote display, Model 9723 (sheet 1 of 1)

NOTES:  
 1. CABLES LEAVING THE CLASS I, DIV. 1 HAZARDOUS LOCATION MUST BE ROUTED THROUGH CONDUIT CARRYING ONLY THOSE CABLES.

2 APPROVED CONDUIT SEAL(S) MUST BE INSTALLED WITHIN 18" [457mm] OF THE HOUSING.

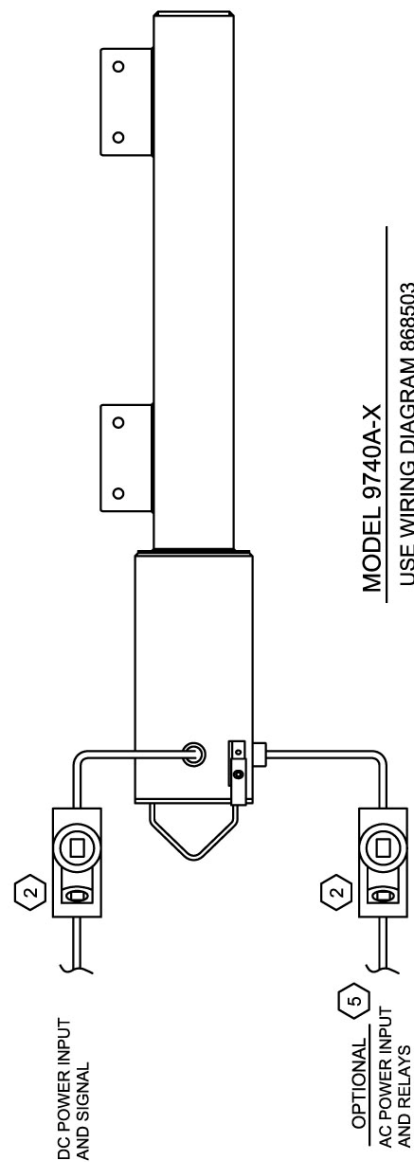
3. EQUIPMENT MUST BE INSTALLED BY QUALIFIED PERSONNEL.

4. CONDUIT, CONDUIT SEALS AND WIRING SUPPLIED BY OTHERS.

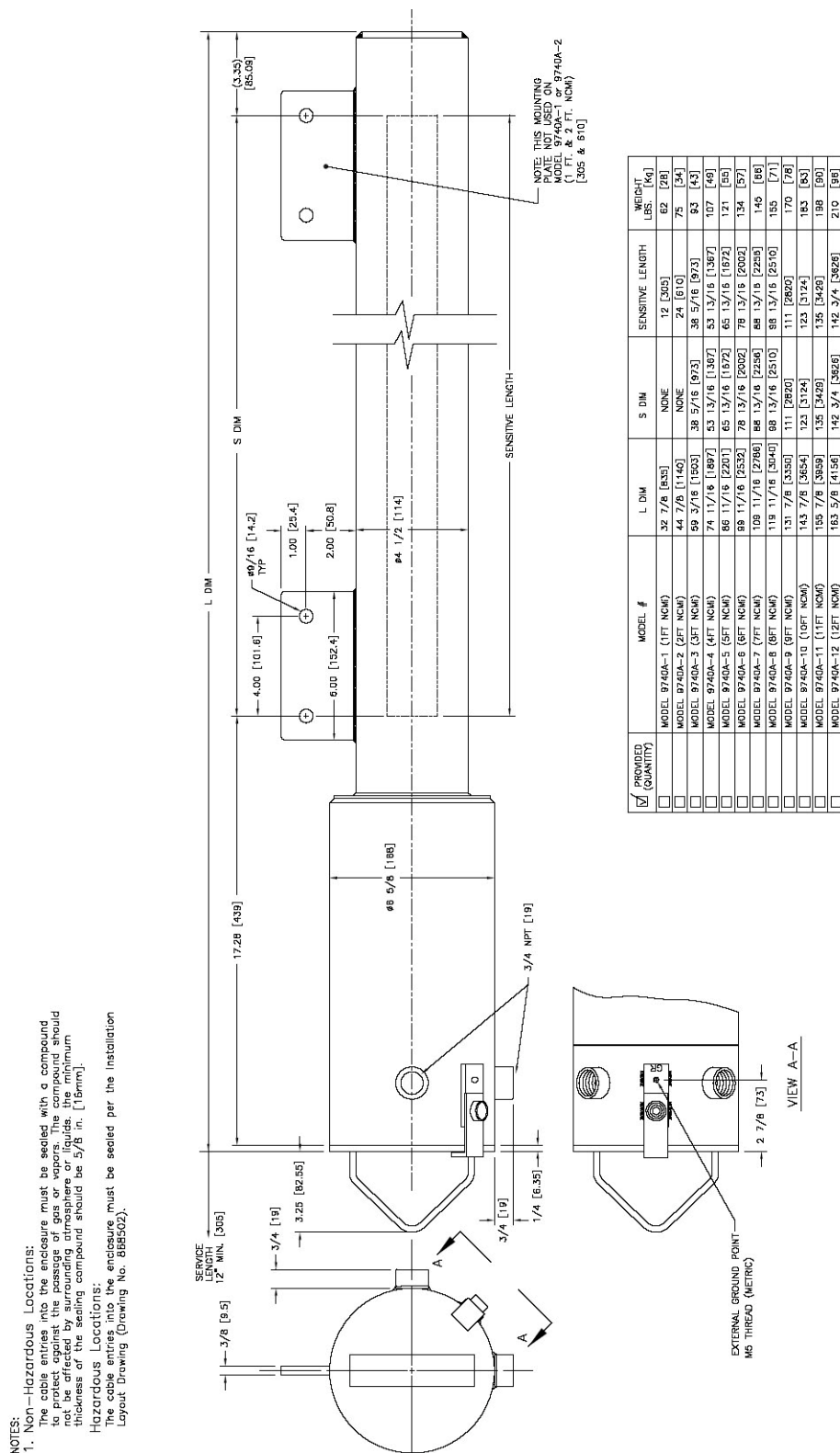
5 AC POWER WIRING PER NEC OR CSA REQUIREMENTS OR APPROPRIATE LOCAL STANDARDS FOR HAZARDOUS LOCATIONS.

CSA/FM APPROVED

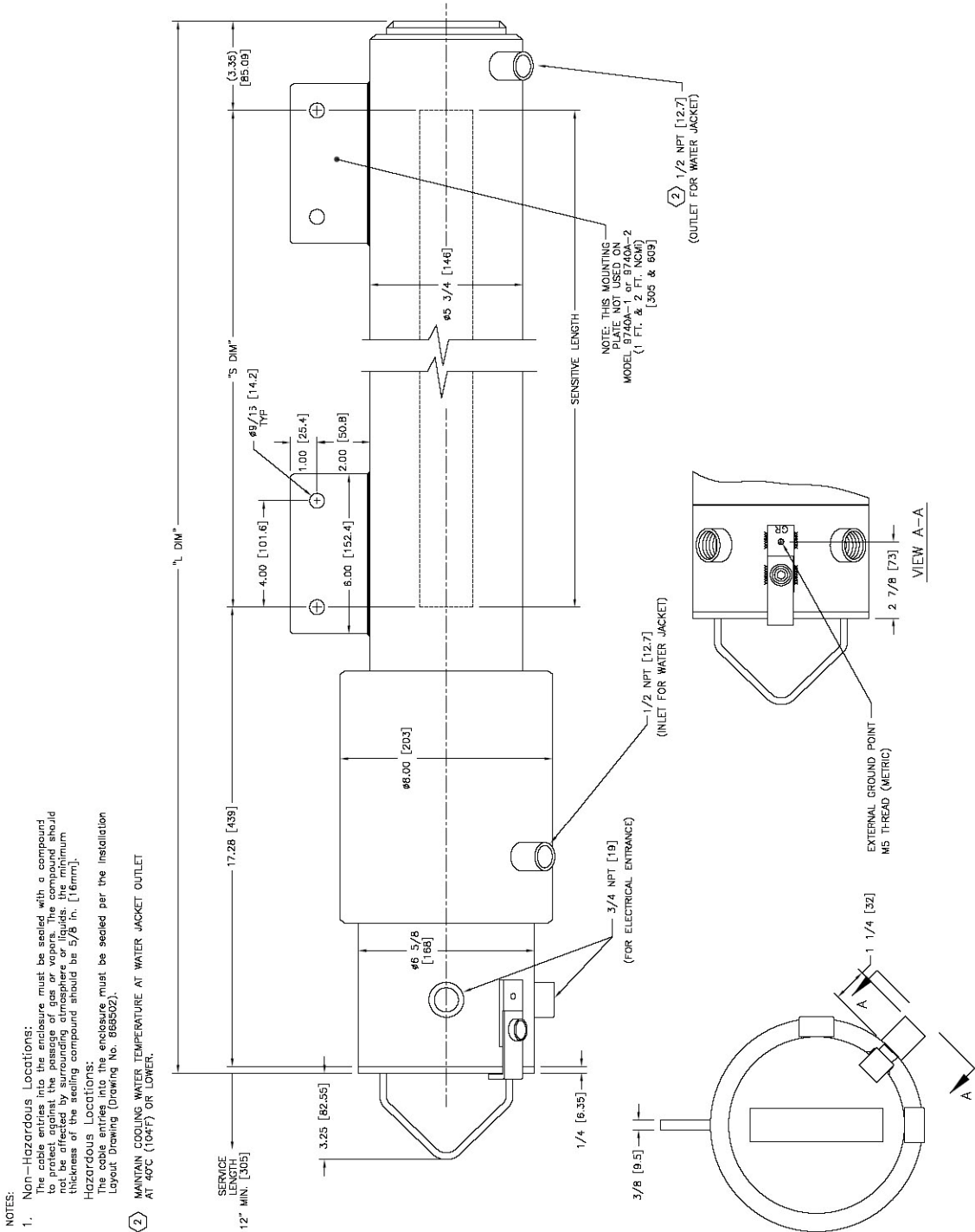
CLASS I, DIV 1, GROUPS B, C, D  
 CLASS II, DIV 1, GROUPS E, F, G  
 CLASS III, DIV 1



**Figure C-7.** 868502: Installation layout – LevelPRO Model 9740A-X (sheet 1 of 1)

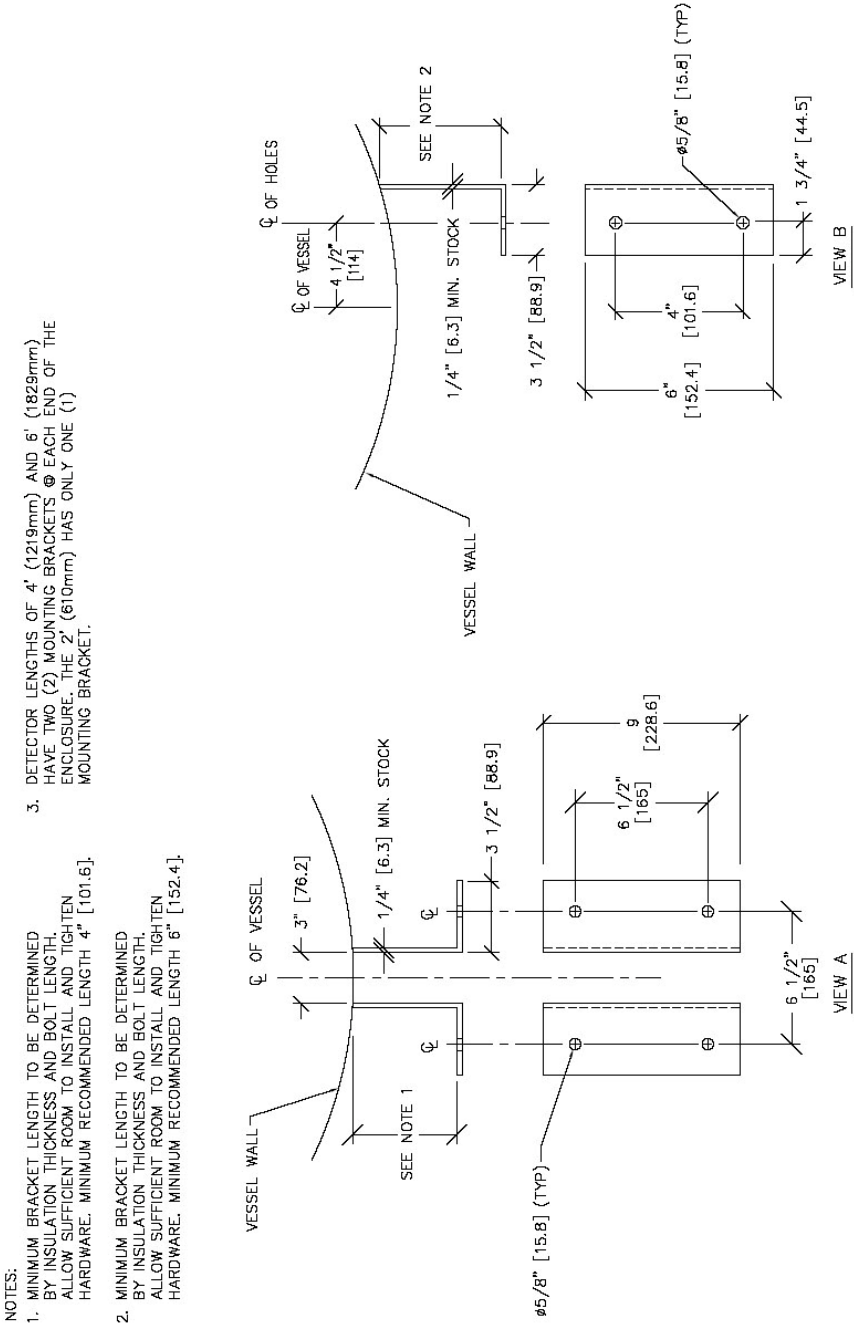


**Figure C–8.** 868672: Mounting dimensions – LevelPRO Model 9740A-X (sheet 1 of 1)



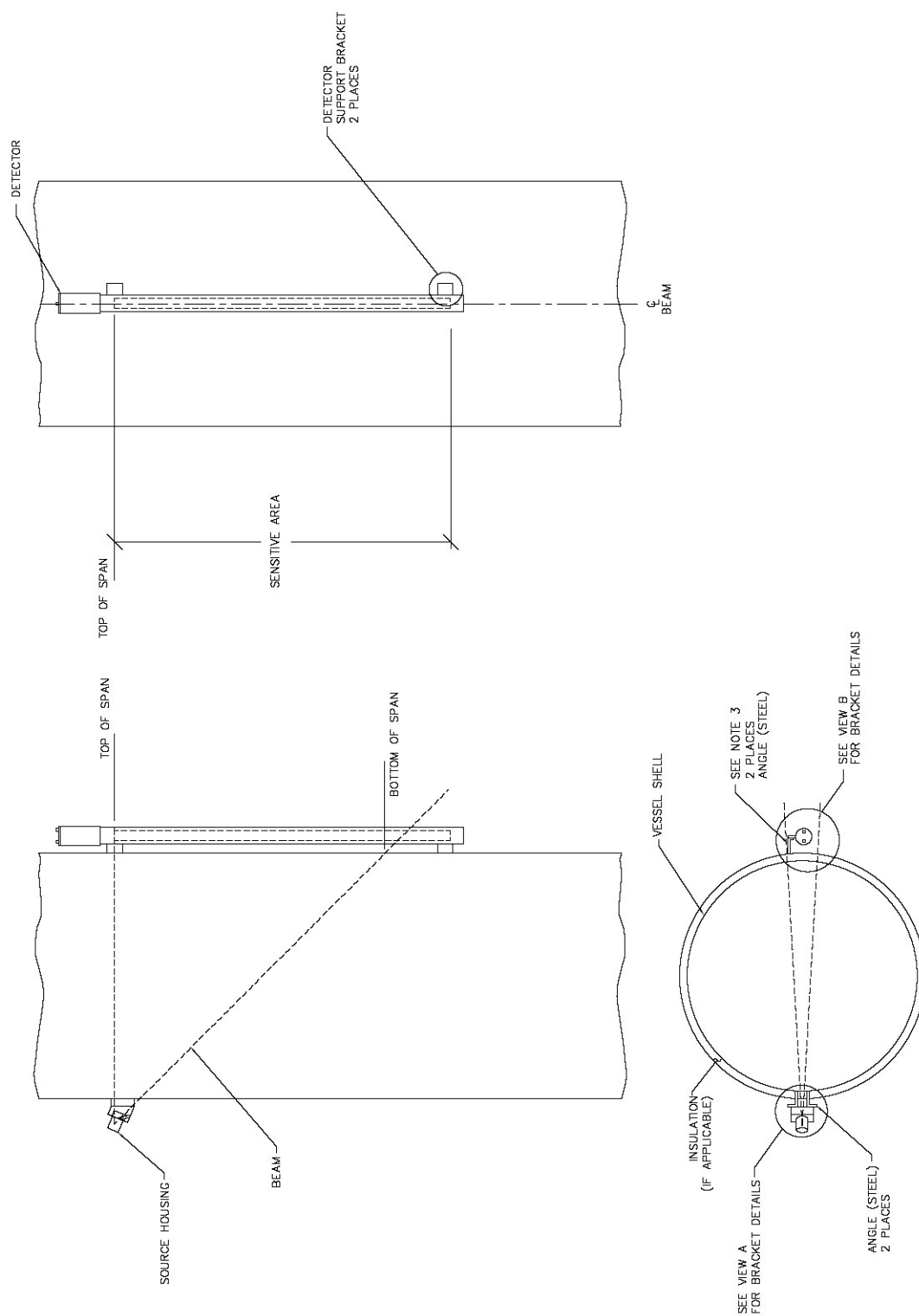
PROVIDED QUANTITY	MODEL #	L DIM"	S DIM"	SENSITIVE LENGTH	WEIGHT LBS. [kg]
<input type="checkbox"/>	MODEL 9740A-1 (1 FT. NCW)	32 7/8 [835]	NONE	12 [305]	90 [41]
<input type="checkbox"/>	MODEL 9740A-2 (2 FT. NCW)	44 7/8 [1140]	NONE	24 [610]	118 [54]
<input type="checkbox"/>	MODEL 9740A-3 (3 FT. NCW)	59 3/16 [1503]	38 5/16 [973]	38 5/16 [973]	153 [70]
<input type="checkbox"/>	MODEL 9740A-4 (4 FT. NCW)	74 11/16 [1897]	53 13/16 [1367]	53 13/16 [1367]	187 [86]
<input type="checkbox"/>	MODEL 9740A-5 (5 FT. NCW)	86 11/16 [2201]	65 13/16 [1672]	65 13/16 [1672]	217 [99]
<input type="checkbox"/>	MODEL 9740A-6 (6 FT. NCW)	99 11/16 [2532]	78 13/16 [2002]	78 13/16 [2002]	244 [111]
<input type="checkbox"/>	MODEL 9740A-7 (7 FT. NCW)	108 11/16 [2786]	88 13/16 [2256]	88 13/16 [2256]	268 [122]
<input type="checkbox"/>	MODEL 9740A-8 (8 FT. NCW)	119 11/16 [3040]	98 13/16 [2510]	98 13/16 [2510]	286 [130]
<input type="checkbox"/>	MODEL 9740A-9 (9 FT. NCW)	131 7/8 [3350]	111 [2820]	111 [2820]	319 [145]
<input type="checkbox"/>	MODEL 9740A-10 (10 FT. NCW)	143 7/8 [3654]	123 [3124]	123 [3124]	346 [158]
<input type="checkbox"/>	MODEL 9740A-11 (11 FT. NCW)	155 7/8 [3958]	135 [3428]	135 [3428]	375 [171]
<input type="checkbox"/>	MODEL 9740A-12 (12 FT. NCW)	163 5/8 [4156]	142 3/4 [3626]	142 3/4 [3626]	397 [181]

Figure C-9. 868674: Mounting dimensions – LevelPRO water-cooled Model 9740A-X (sheet 1 of 1)

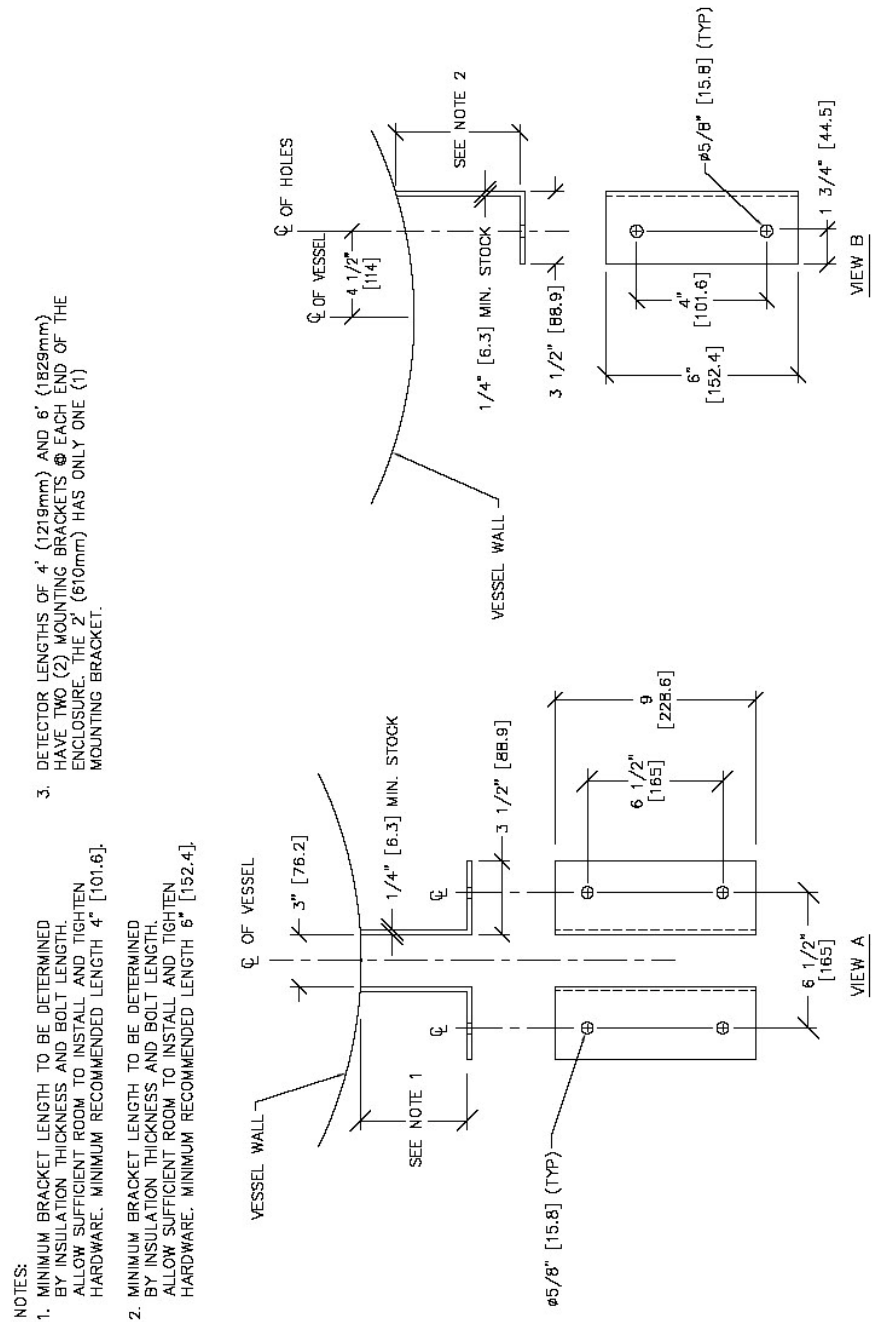


**Figure C-10.** 868568: LevelPRO installation / arrangement drawing – 1 source with 1 detector (sheet 1 of 2)

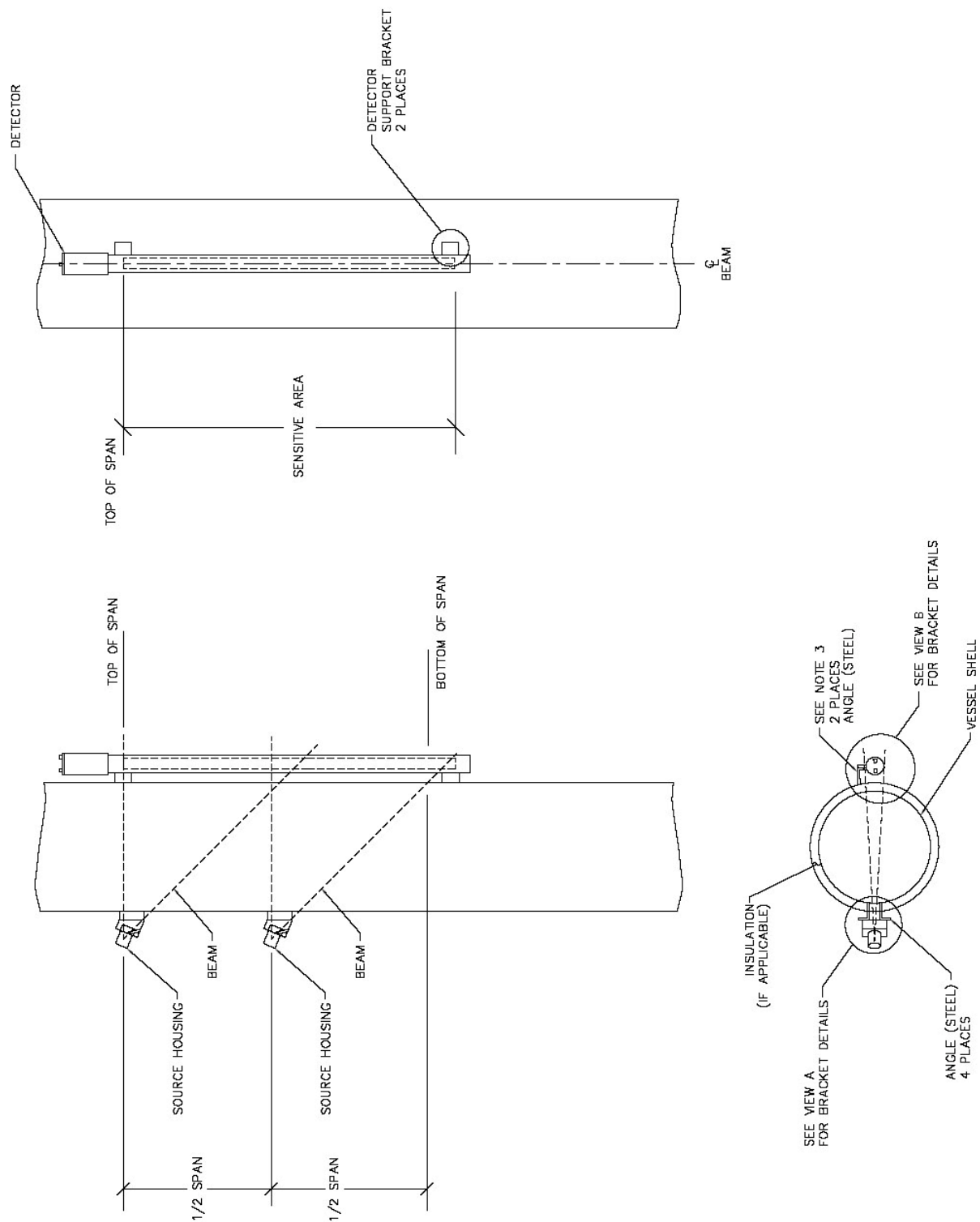




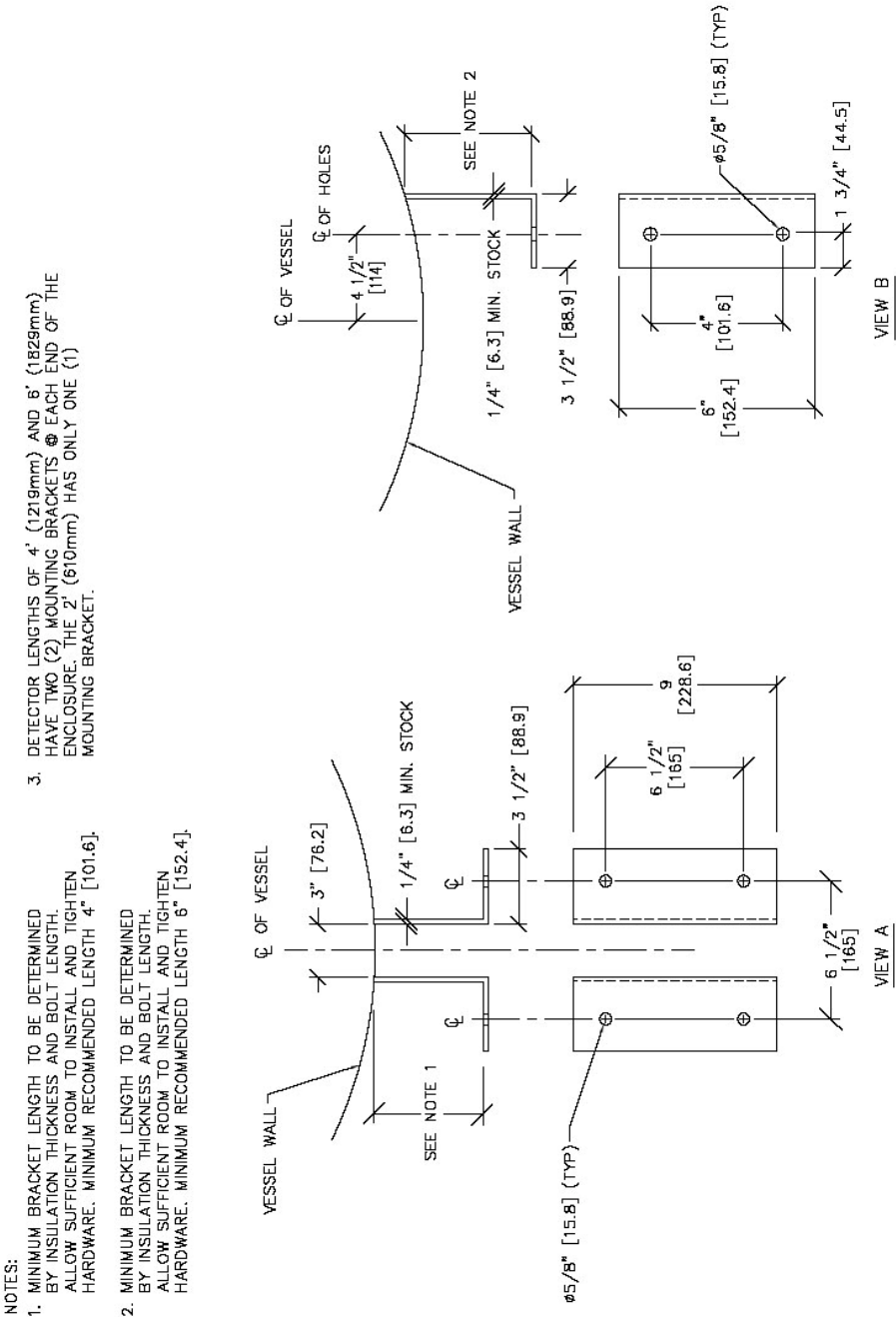
**Figure C–11.** 868568: LevelPRO installation / arrangement drawing – 1 source with 1 detector (sheet 2 of 2)



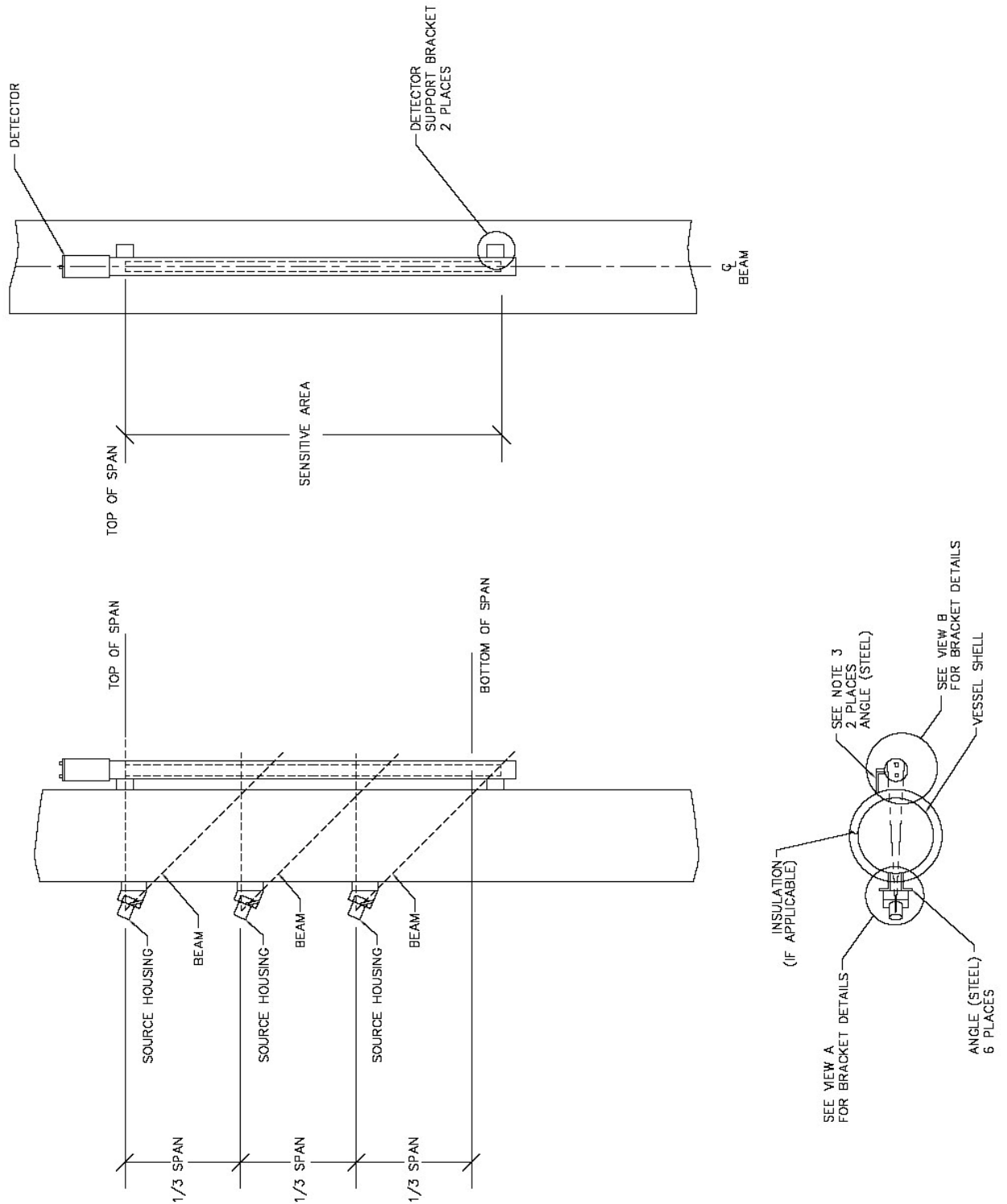
**Figure C-12.** 868569: LevelPRO installation / arrangement drawing – 2 sources with 1 detector (sheet 1 of 2)



**Figure C-13.** 868569: LevelPRO installation / arrangement drawing – 2 sources with 1 detector (sheet 2 of 2)

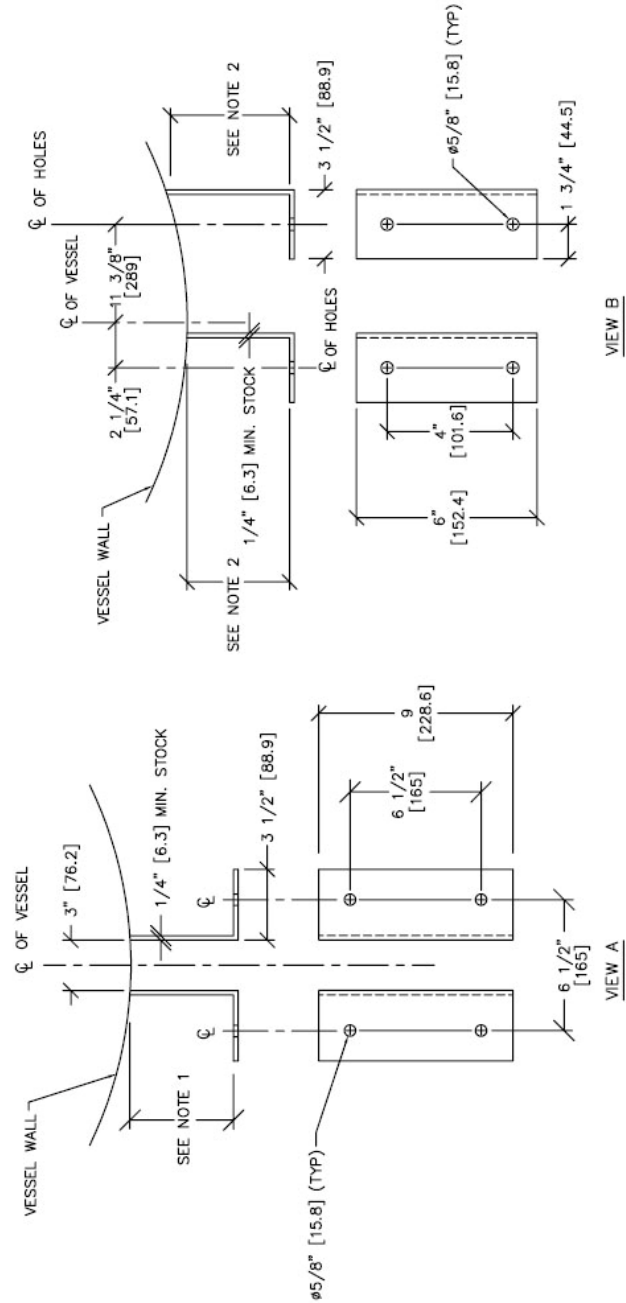


**Figure C–14.** 868566: LevelPRO installation / arrangement drawing – 3 sources with 1 detector (sheet 1 of 2)

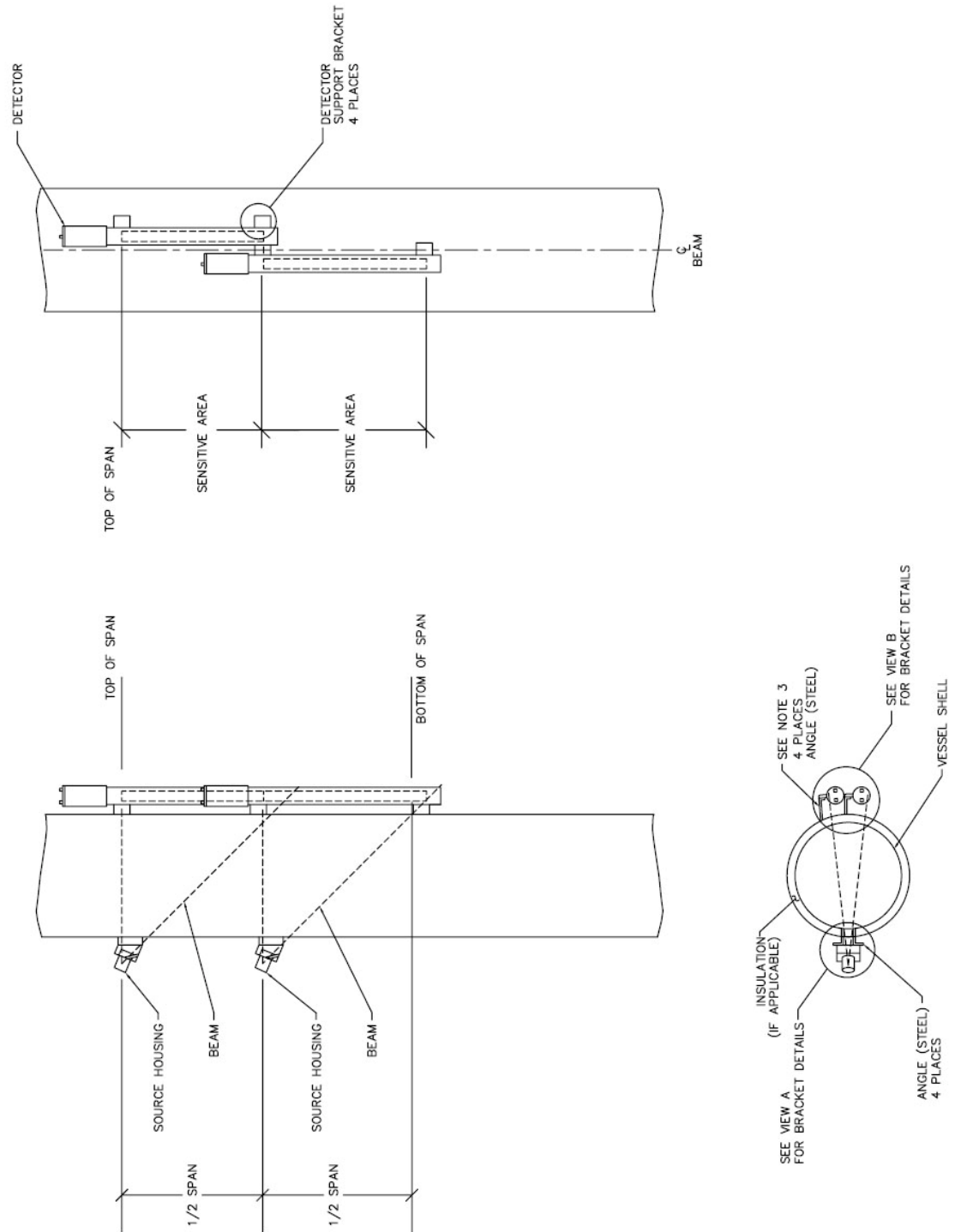


**Figure C–15.** 868566: LevelPRO installation / arrangement drawing – 3 sources with 1 detector (sheet 2 of 2)

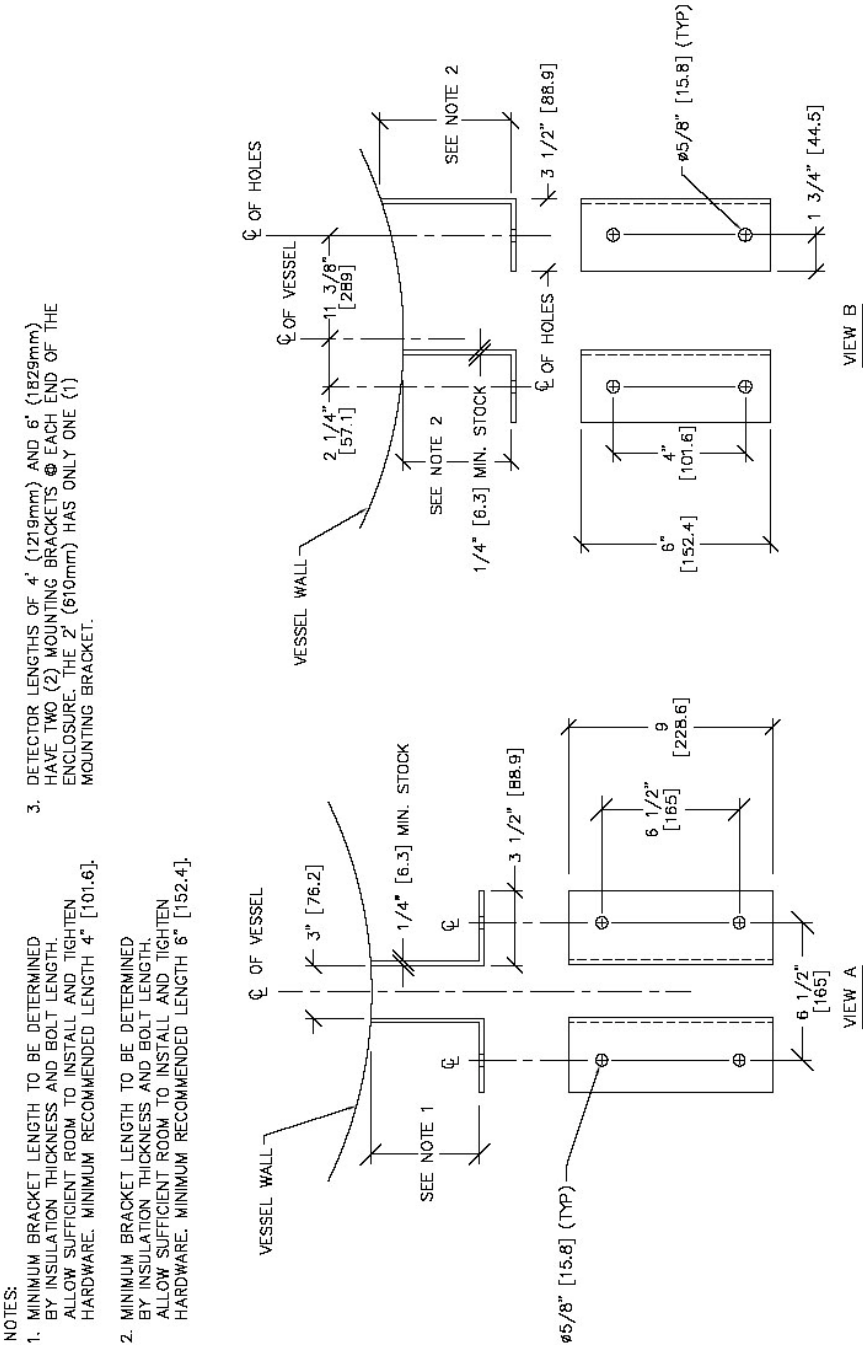
- NOTES:
1. MINIMUM BRACKET LENGTH TO BE DETERMINED BY INSULATION THICKNESS AND BOLT LENGTH. ALLOW SUFFICIENT ROOM TO INSTALL AND TIGHTEN HARDWARE. MINIMUM RECOMMENDED LENGTH 4" [101.6].
  2. MINIMUM BRACKET LENGTH TO BE DETERMINED BY INSULATION THICKNESS AND BOLT LENGTH. ALLOW SUFFICIENT ROOM TO INSTALL AND TIGHTEN HARDWARE. MINIMUM RECOMMENDED LENGTH 6" [152.4].
  3. DETECTOR LENGTHS OF 4' (1219mm) AND 6' (1829mm) HAVE TWO (2) MOUNTING BRACKETS @ EACH END OF THE ENCLOSURE. THE 2' (610mm) HAS ONLY ONE (1) MOUNTING BRACKET.



**Figure C–16.** 868567: LevelPRO installation / arrangement drawing – 2 sources with 2 detectors (sheet 1 of 2)

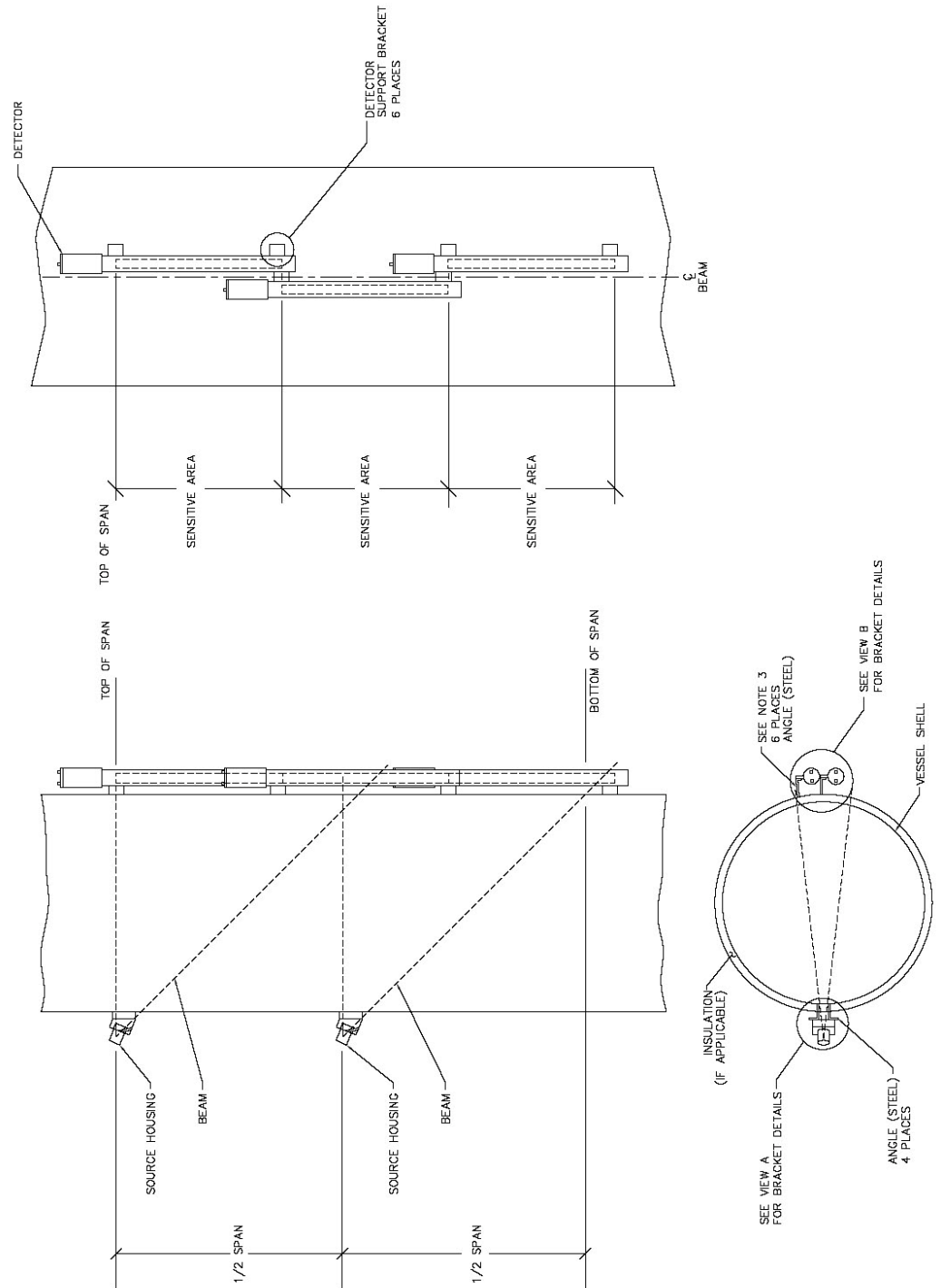


**Figure C-17.** 868567: LevelPRO installation / arrangement drawing – 2 sources with 2 detectors (sheet 2 of 2)

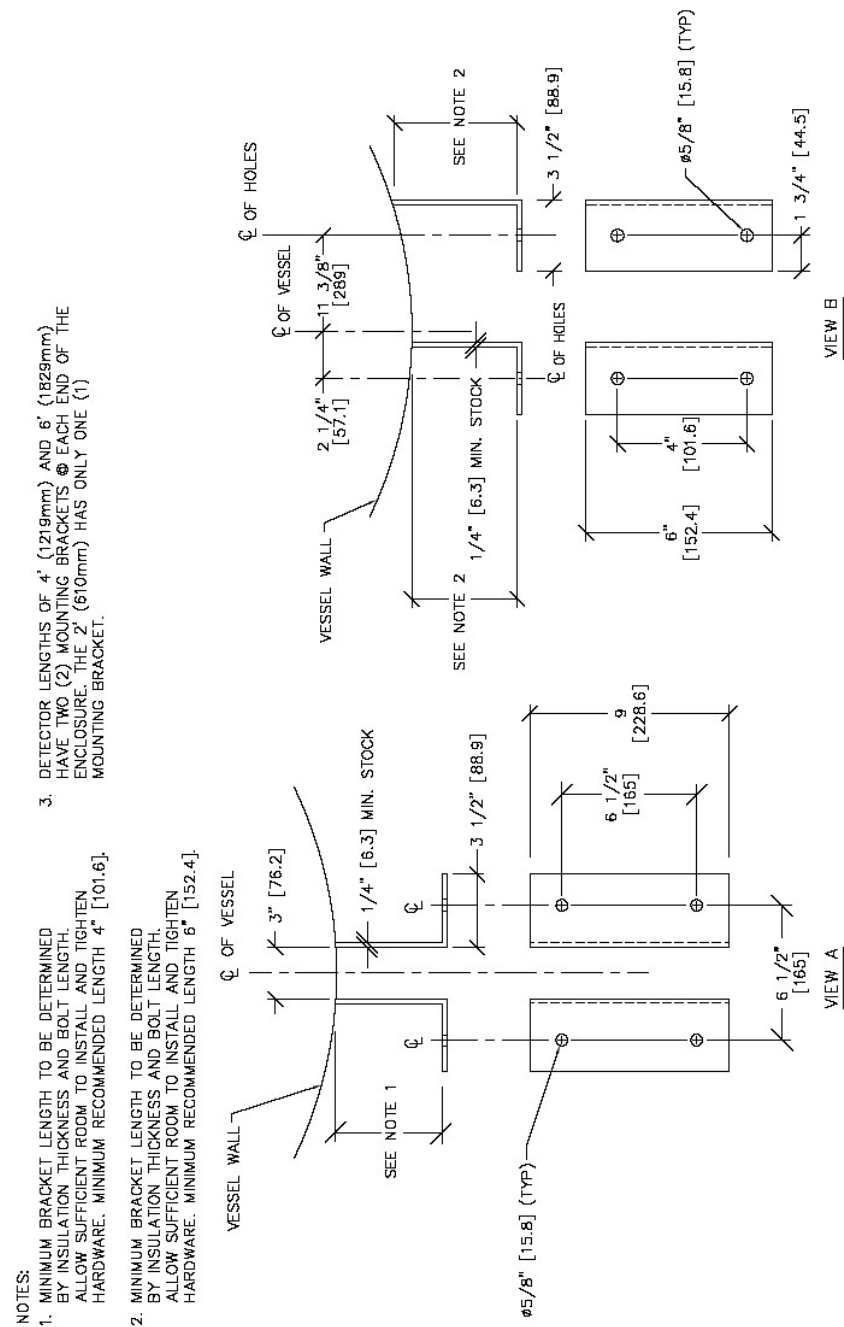


**Figure C–18.** 868570: LevelPRO installation / arrangement drawing – 2 sources with 3 detectors (sheet 1 of 2)

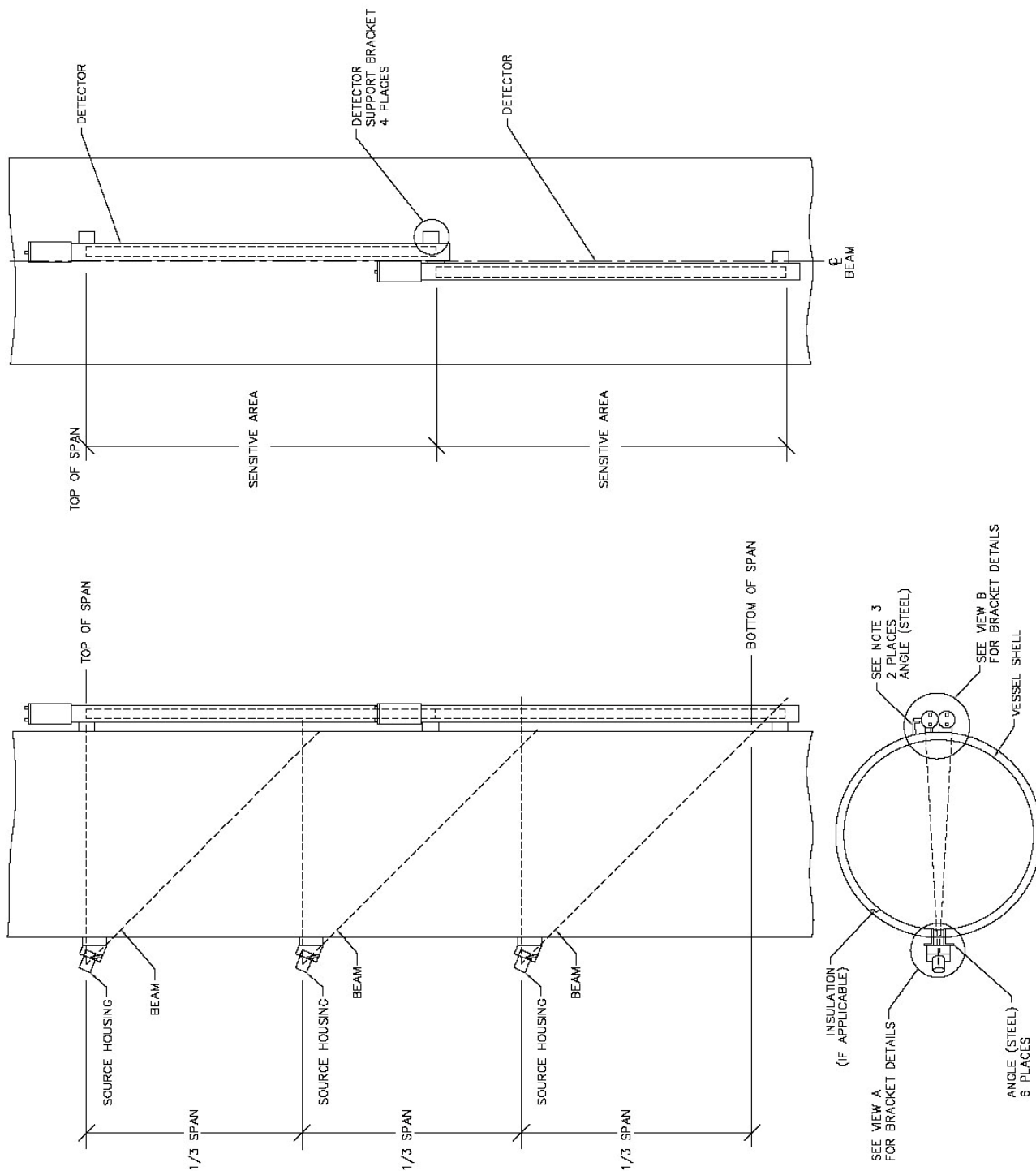




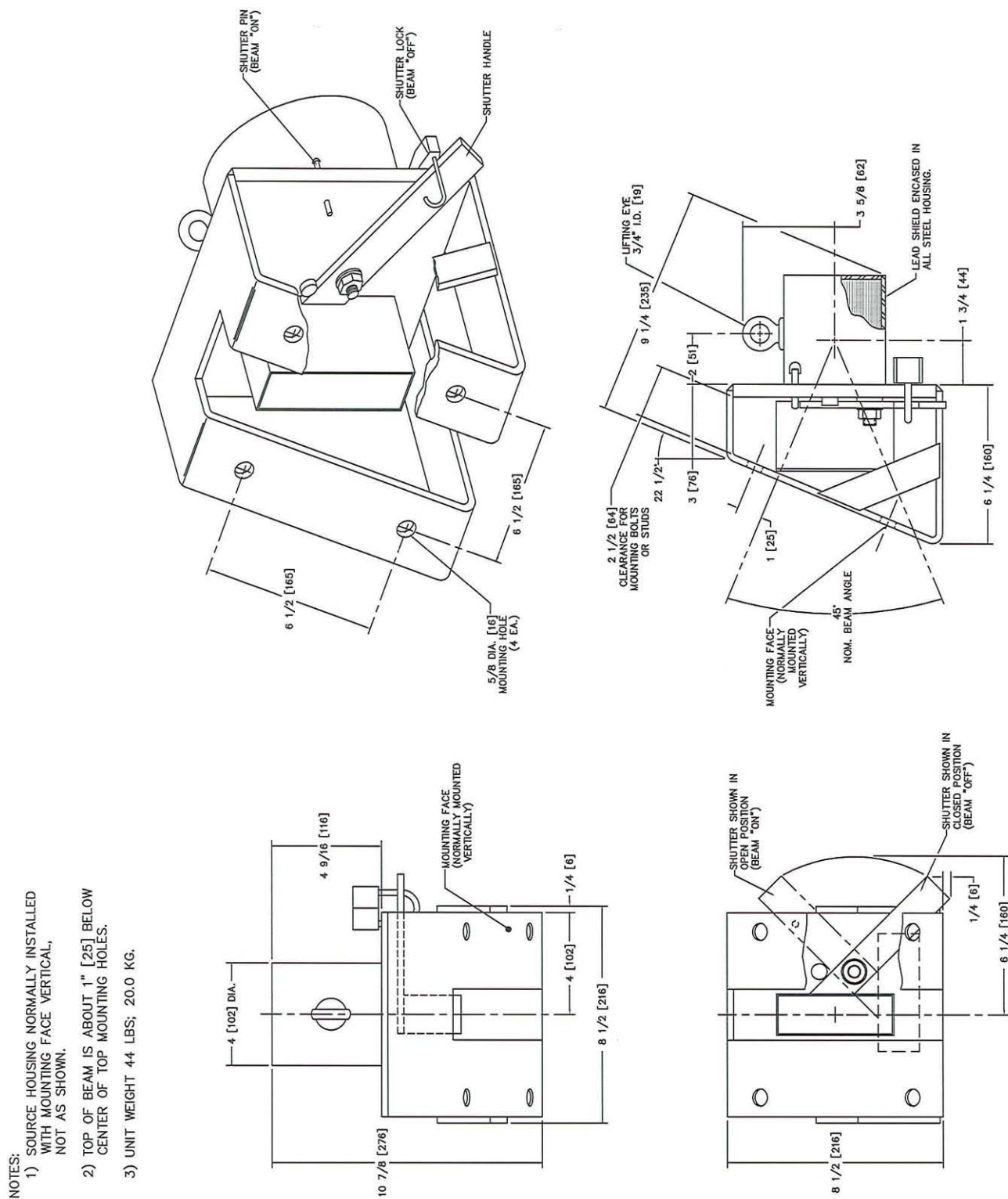
**Figure C–19.** 868570: LevelPRO installation / arrangement drawing – 2 sources with 3 detectors (sheet 2 of 2)



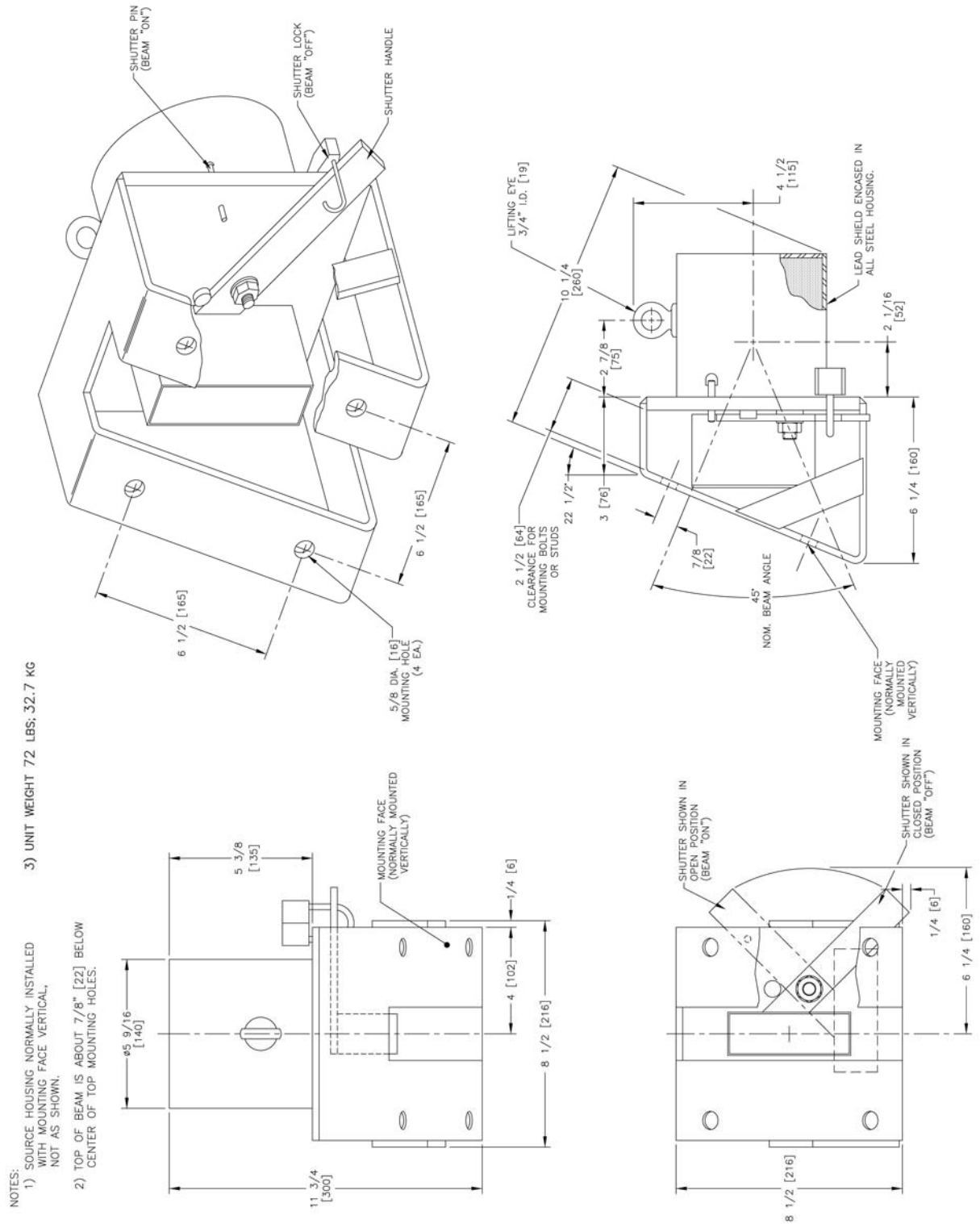
**Figure C-20.** 868571: LevelPRO installation / arrangement drawing – 3 sources with 2 detectors (sheet 1 of 2)



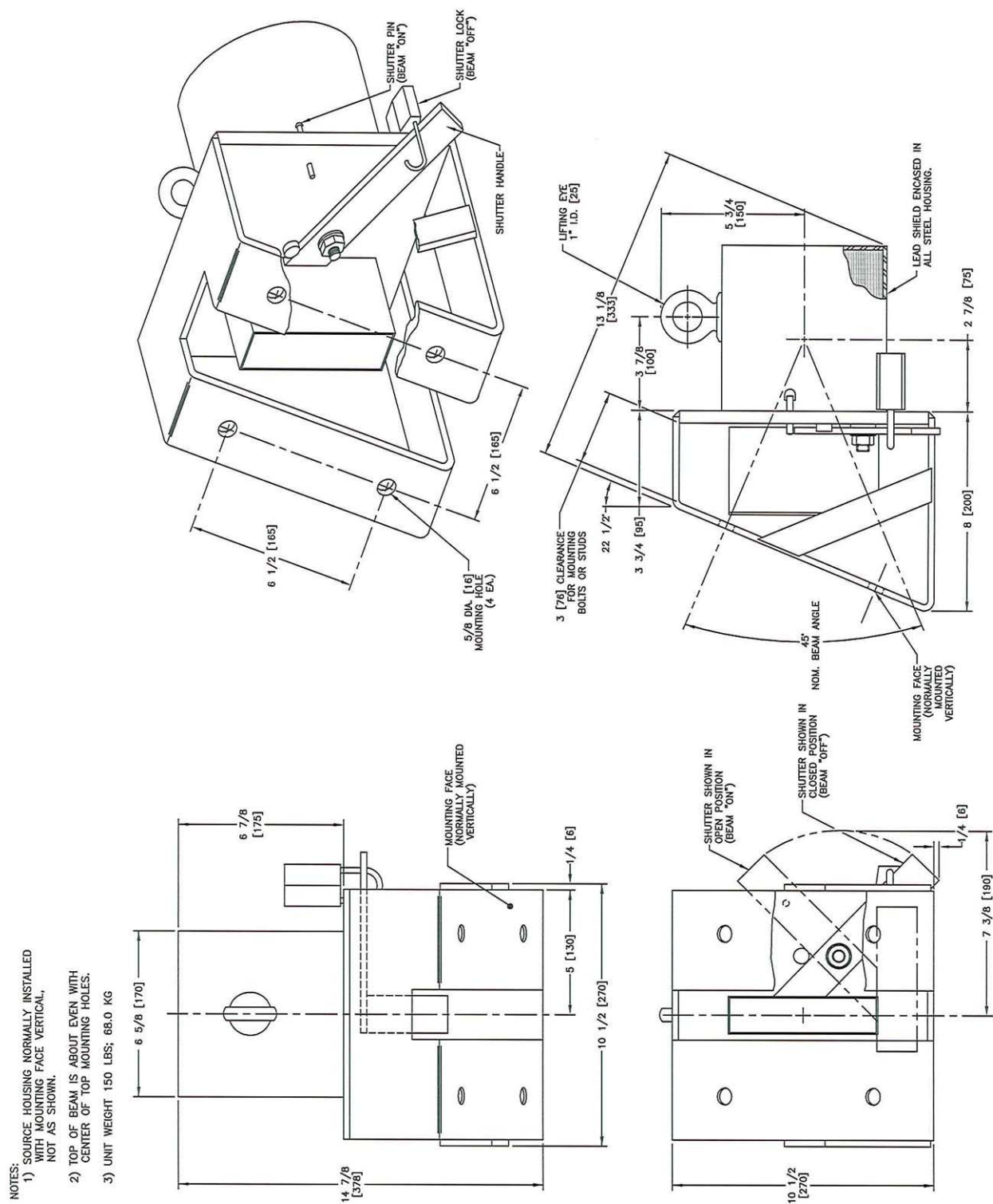
**Figure C-21.** 868571: LevelPRO installation / arrangement drawing – 3 sources with 2 detectors (sheet 2 of 2)



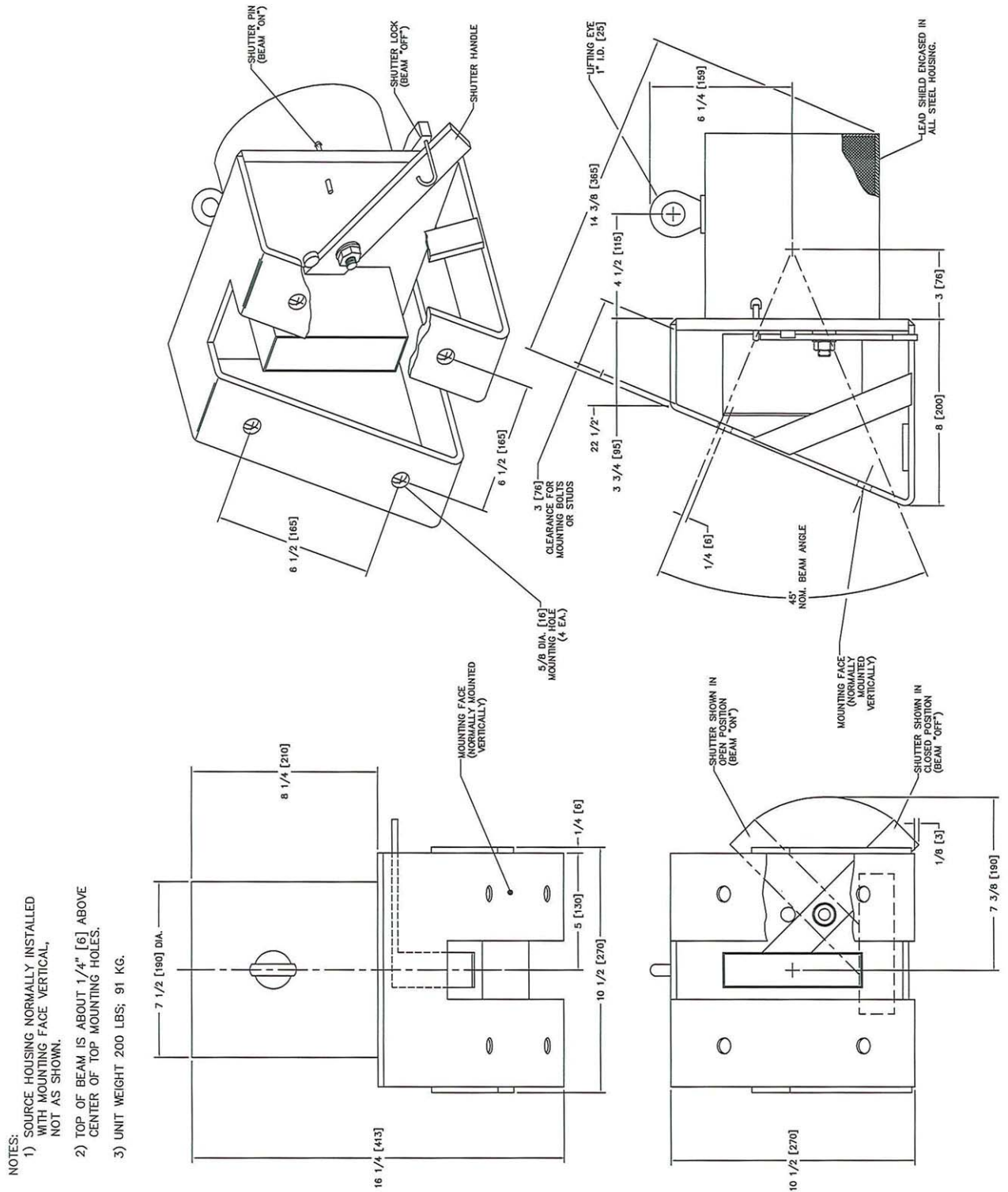
**Figure C-22.** 865494: Mounting dimensions – Model 5205 / 5205A source housing, 100 mCi (sheet 1 of 1)



**Figure C-23.** 865504: Mounting dimensions – Model 5206 source housing, 500 mCi (sheet 1 of 1)

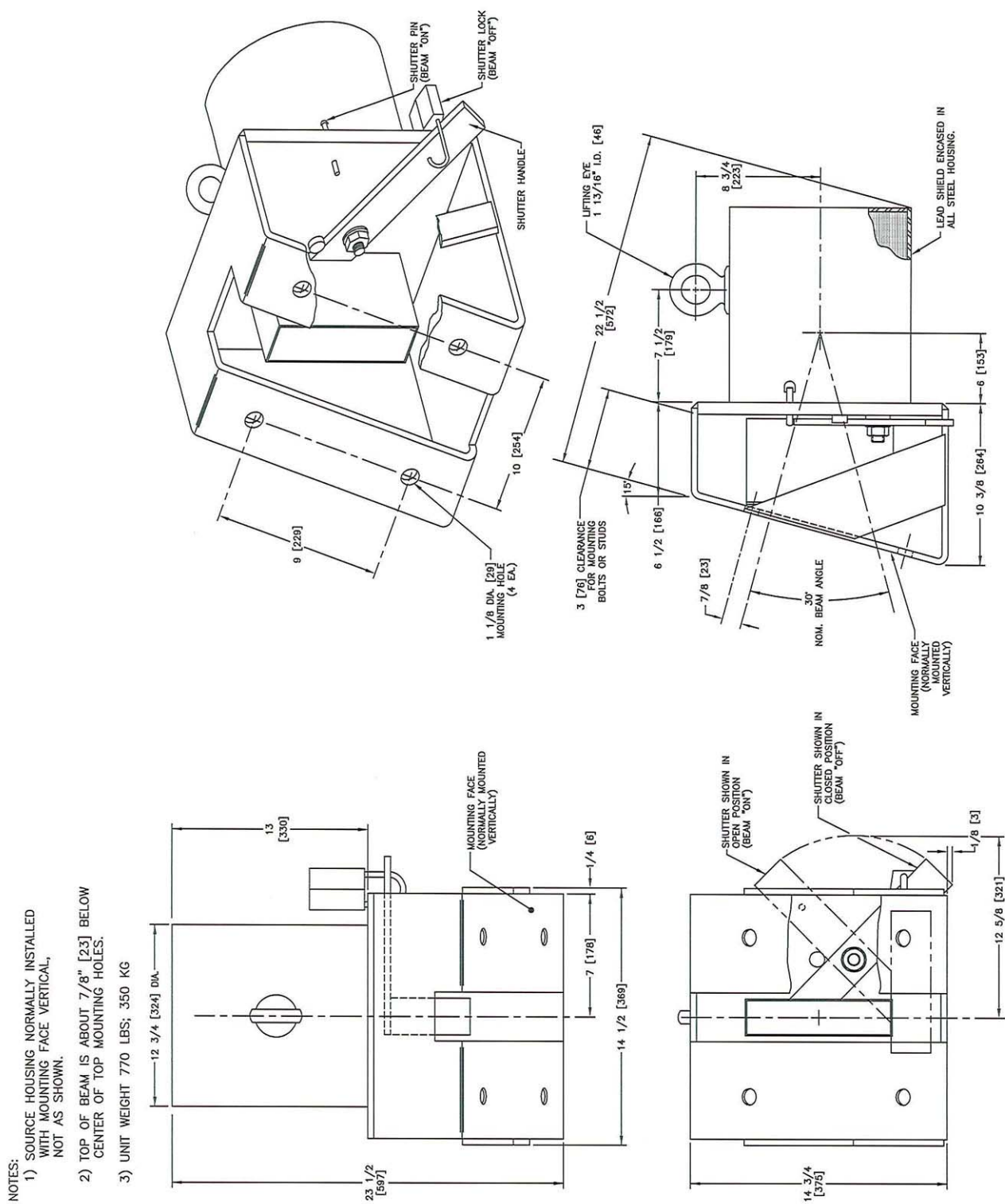


**Figure C-24.** 865514: Mounting dimensions – Model 5207 source housing, 2000 mCi (sheet 1 of 1)



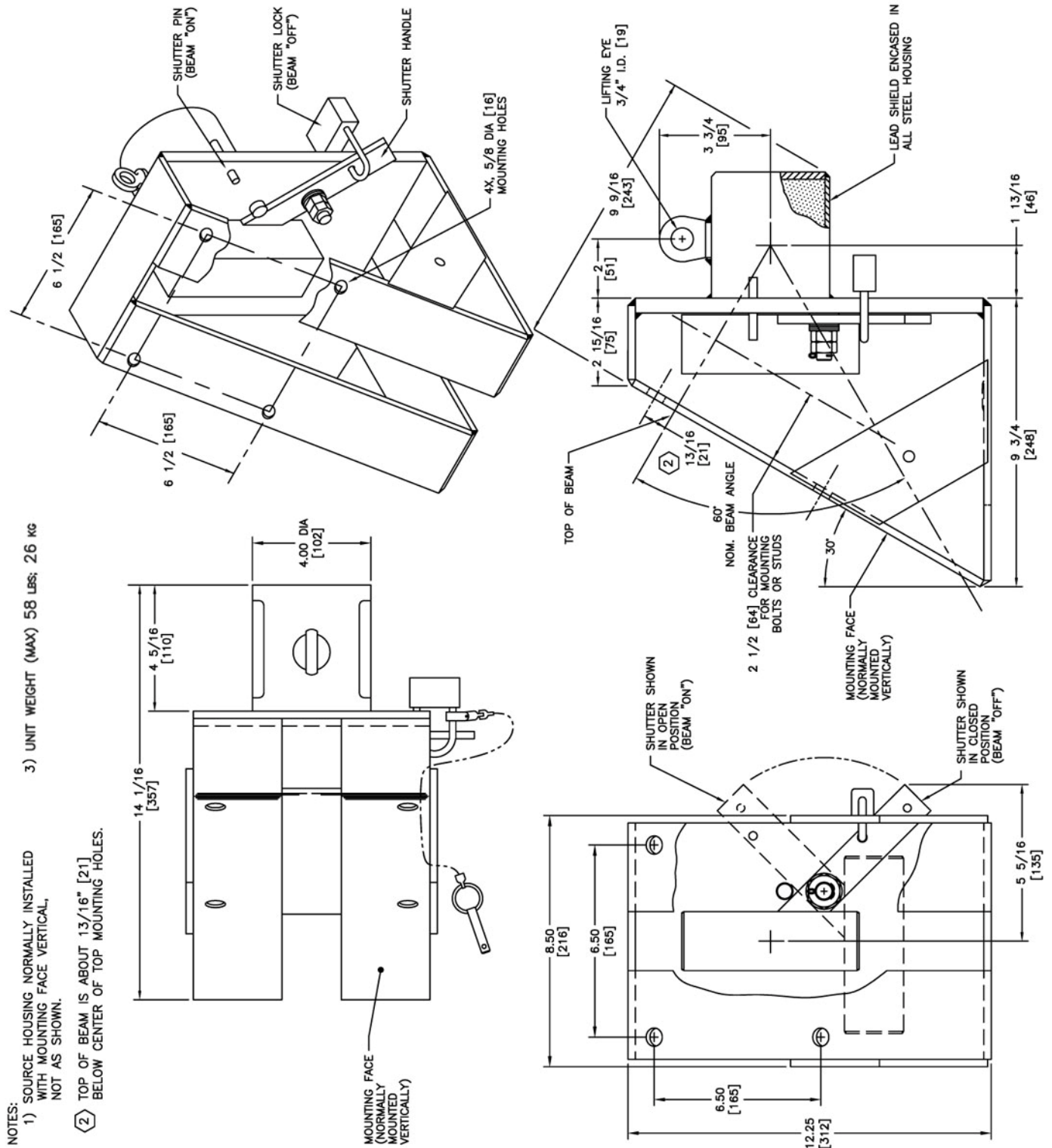
**Figure C-25.** 865524: Mounting dimensions – Model 5208 source housing, 8000 mCi (sheet 1 of 1)



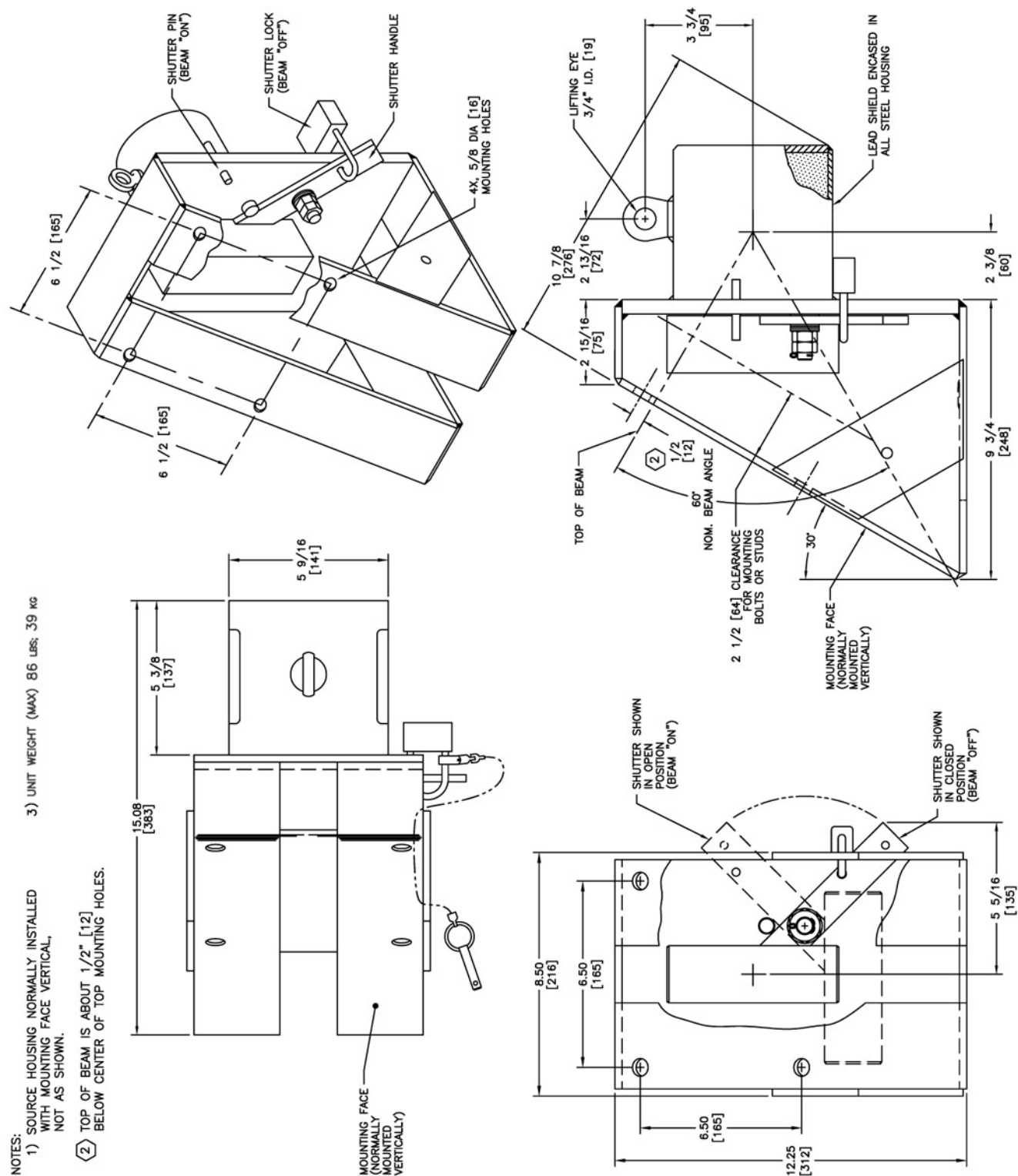


**Figure C-26.** 866891: Mounting dimensions – Model 5210 source housing, 10 Ci Cs-137, 3 Ci Co-60(sheet 1 of 1)

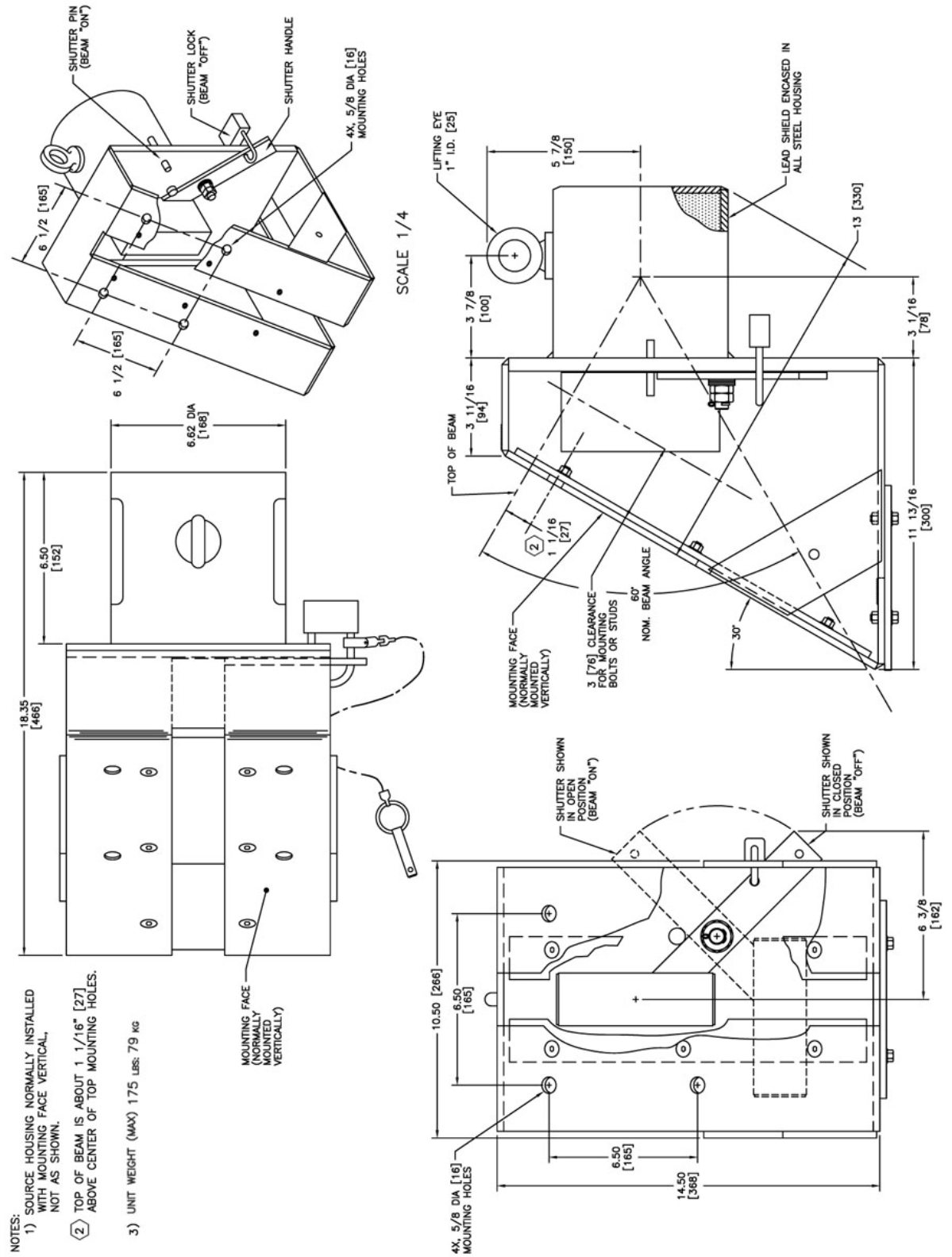




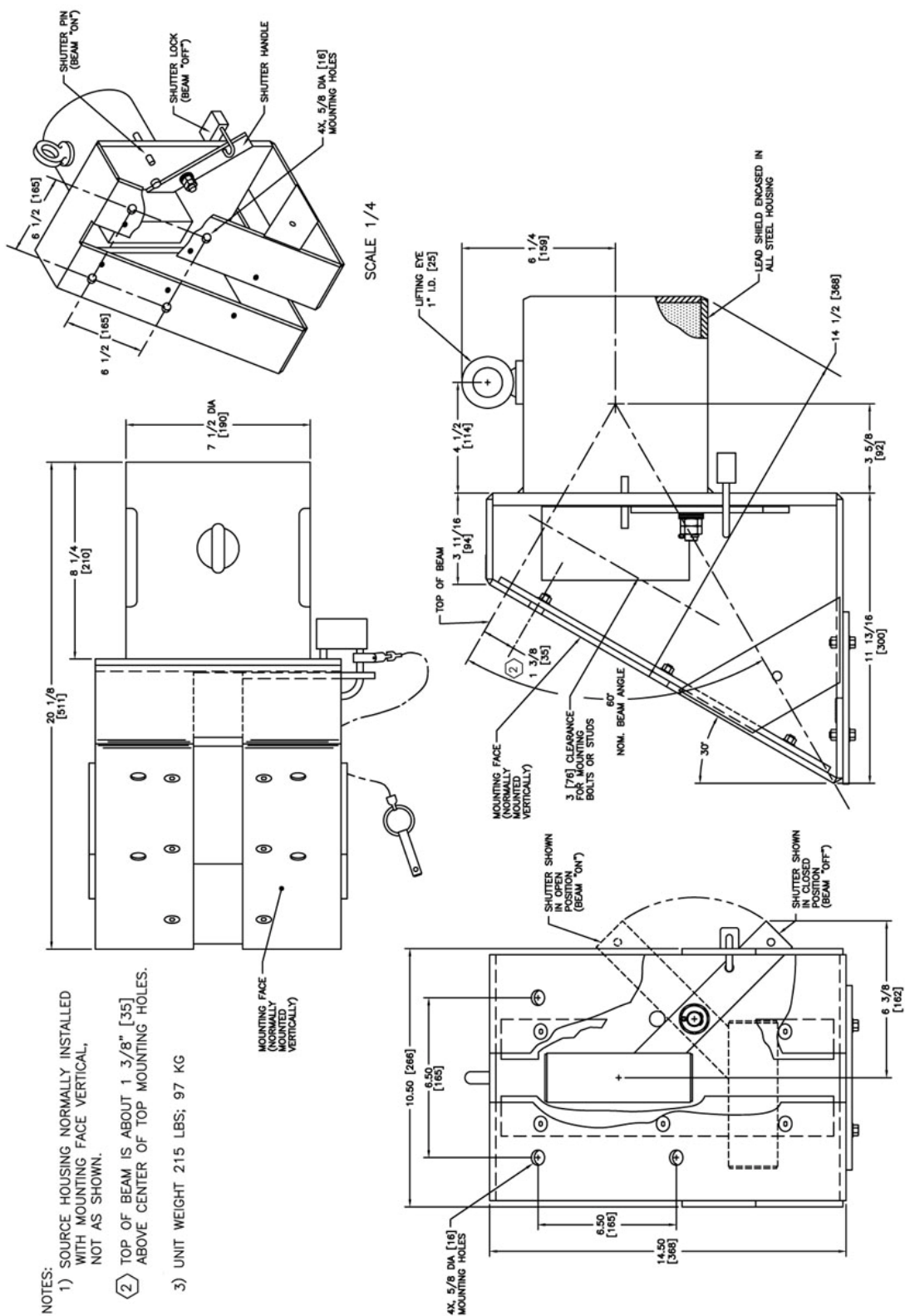
**Figure C-27.** 868628: Mounting dimensions – Model 5205B source housing (sheet 1 of 1)



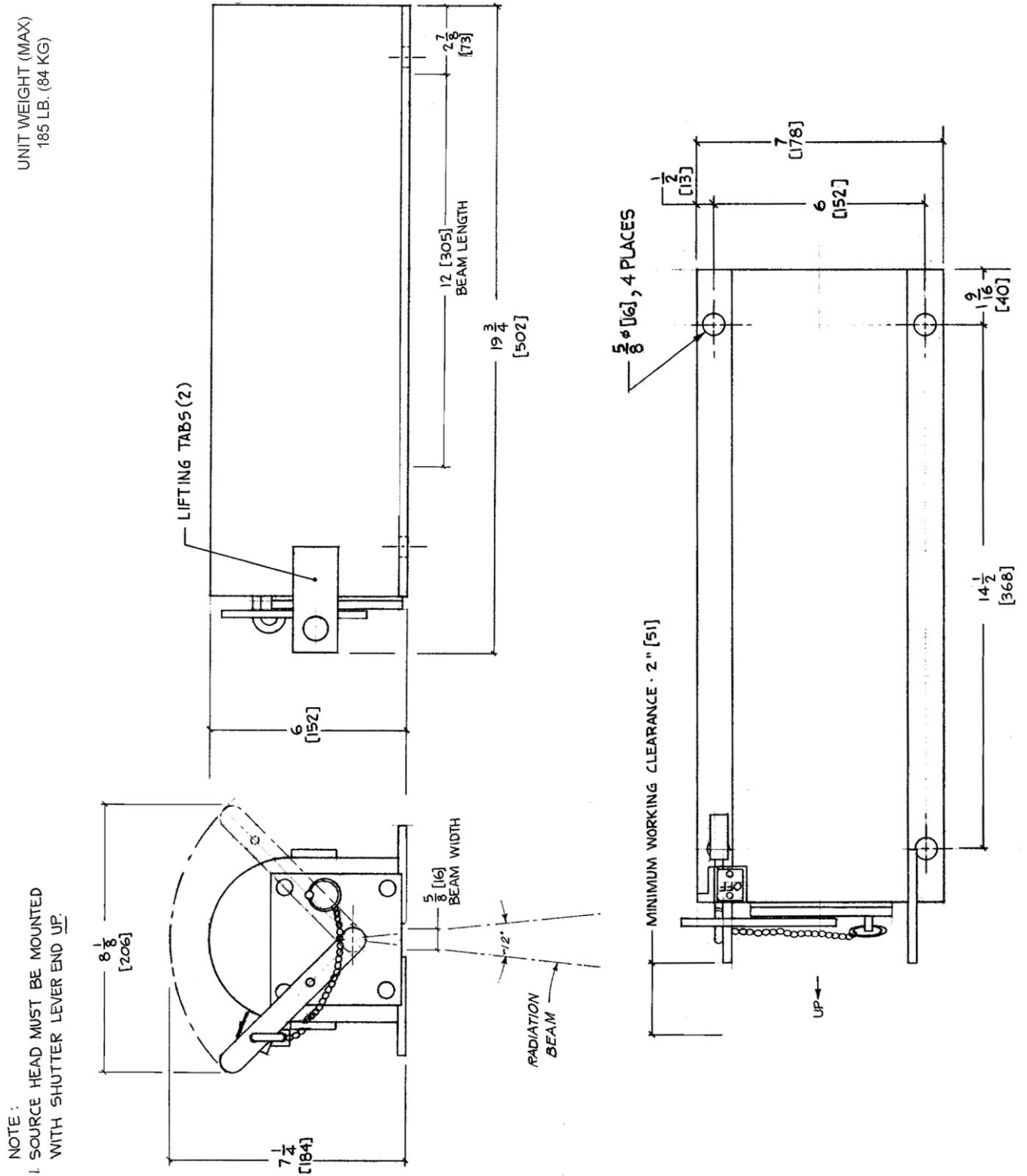
**Figure C-28.** 868629: Mounting dimensions – Model 5206B source housing (sheet 1 of 1)



**Figure C-29.** 868630: Mounting dimensions – Model 5207B source housing (sheet 1 of 1)

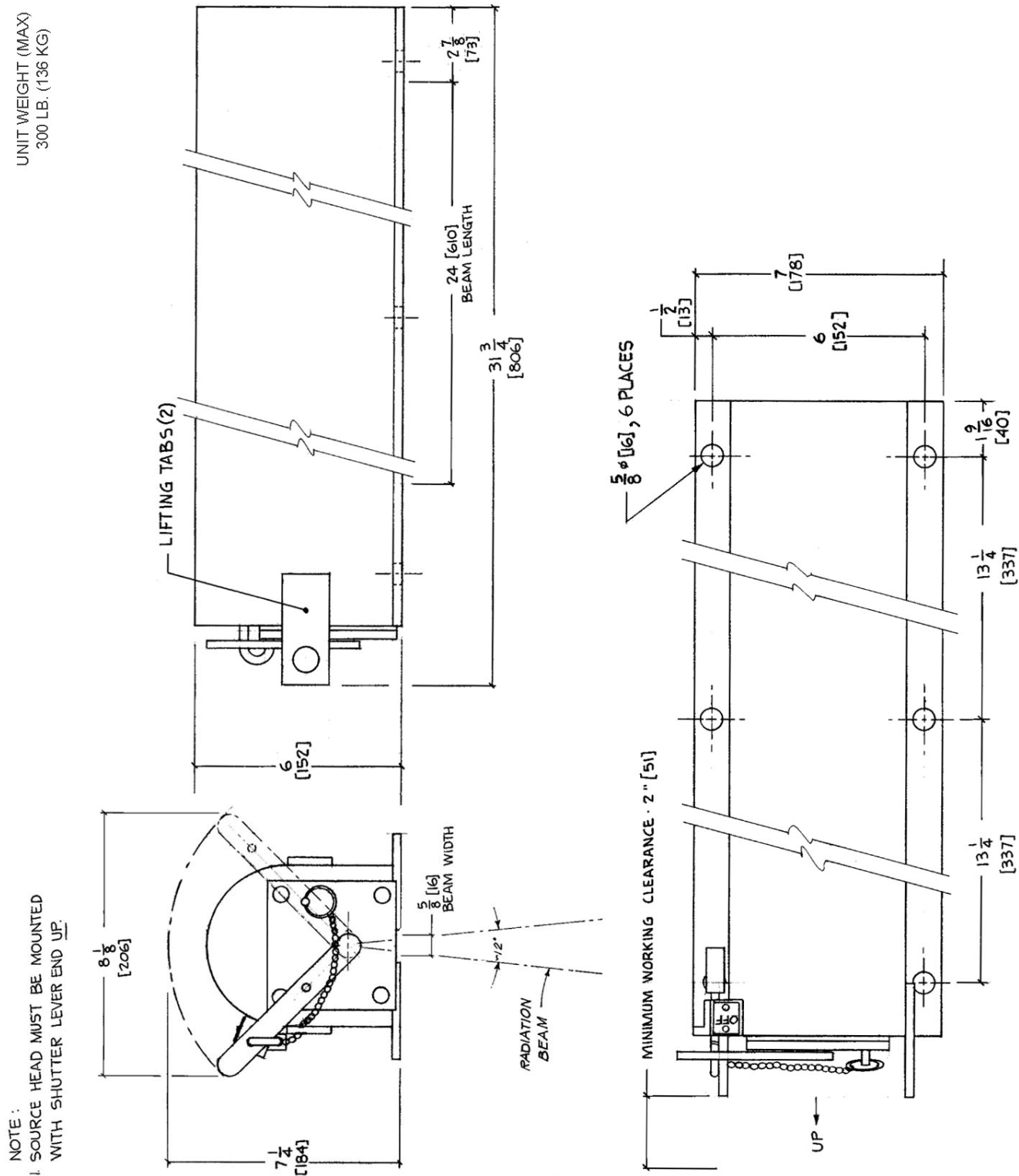


**Figure C-30.** 868631: Mounting dimensions – Model 5208B source housing (sheet 1 of 1)



**Figure C-31.** 860463: Mounting dimensions – Model 5194 strip source, 1 ft, 500 mCi (sheet 1 of 1)



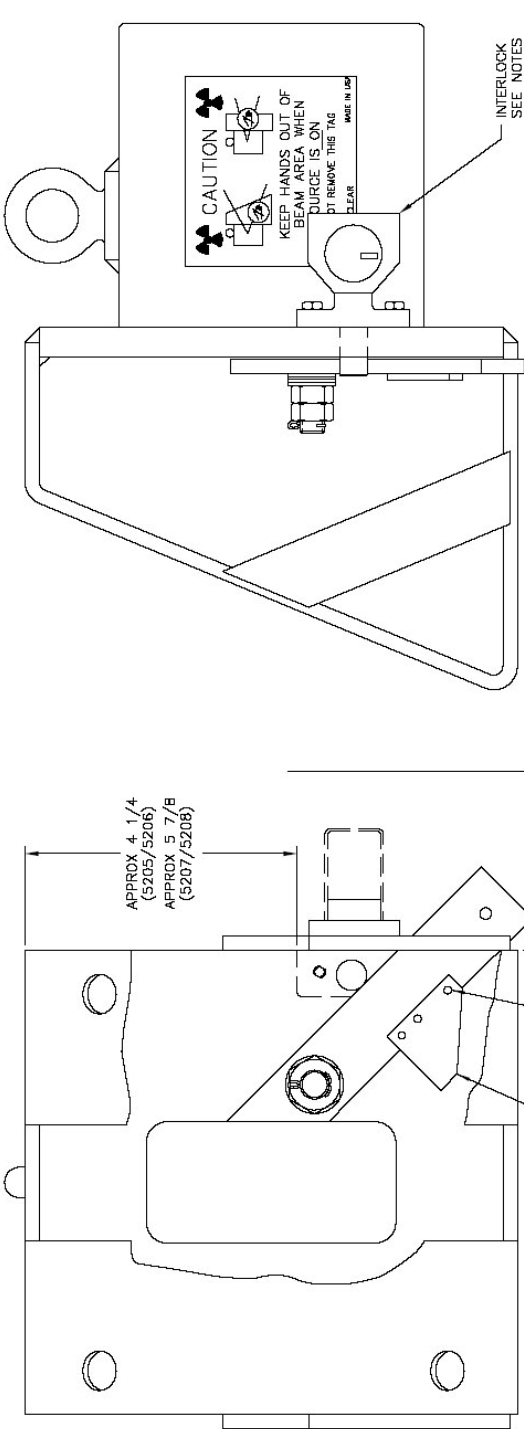


**Figure C-32.** 860473: Mounting dimensions – Model 5195 strip source, 2 ft, 1000 mCi (sheet 1 of 1)



Thermo Fisher Scientific

- NOTES:
- 1. SEE INDIVIDUAL DRAWINGS OF SOURCE HOUSING FOR DIMENSIONAL DETAILS.
  - 2. SOURCE HOUSING IS PRE-DRILLED AND TAPPED TO ALLOW FOR INSTALLATION OF INTERLOCK.
  - 3. INTERLOCK SHOWN IS A SINGLE KEY SYSTEM. FOR INTERLOCK DETAILS, INCLUDING TWO OR MORE KEY SYSTEMS, SEE DRAWING C868704.
  - 4. LOCK ASSEMBLY IS NORMALLY FIELD-INSTALLED BY USER.



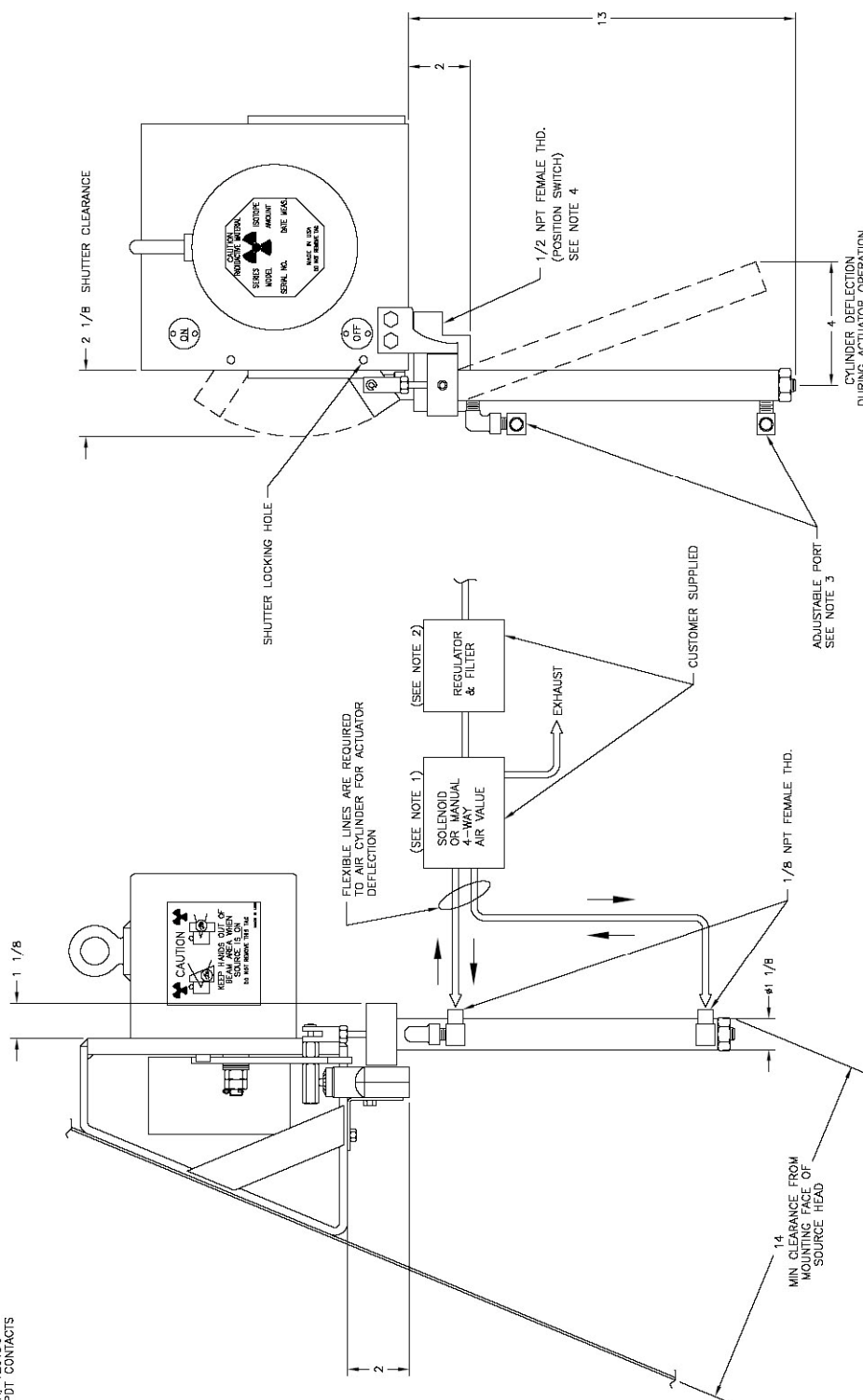
ITEM	DESCRIPTION	PARTS LIST	
		PART NO.	QTY
2	RIVET, POP. 1/8 SS	531170	3
1	TAB, INTERLOCK	433708	1

**Figure C-34.** 866764: Interlock option for Models 5205–5208 source heads (sheet 1 of 1)



NOTES:

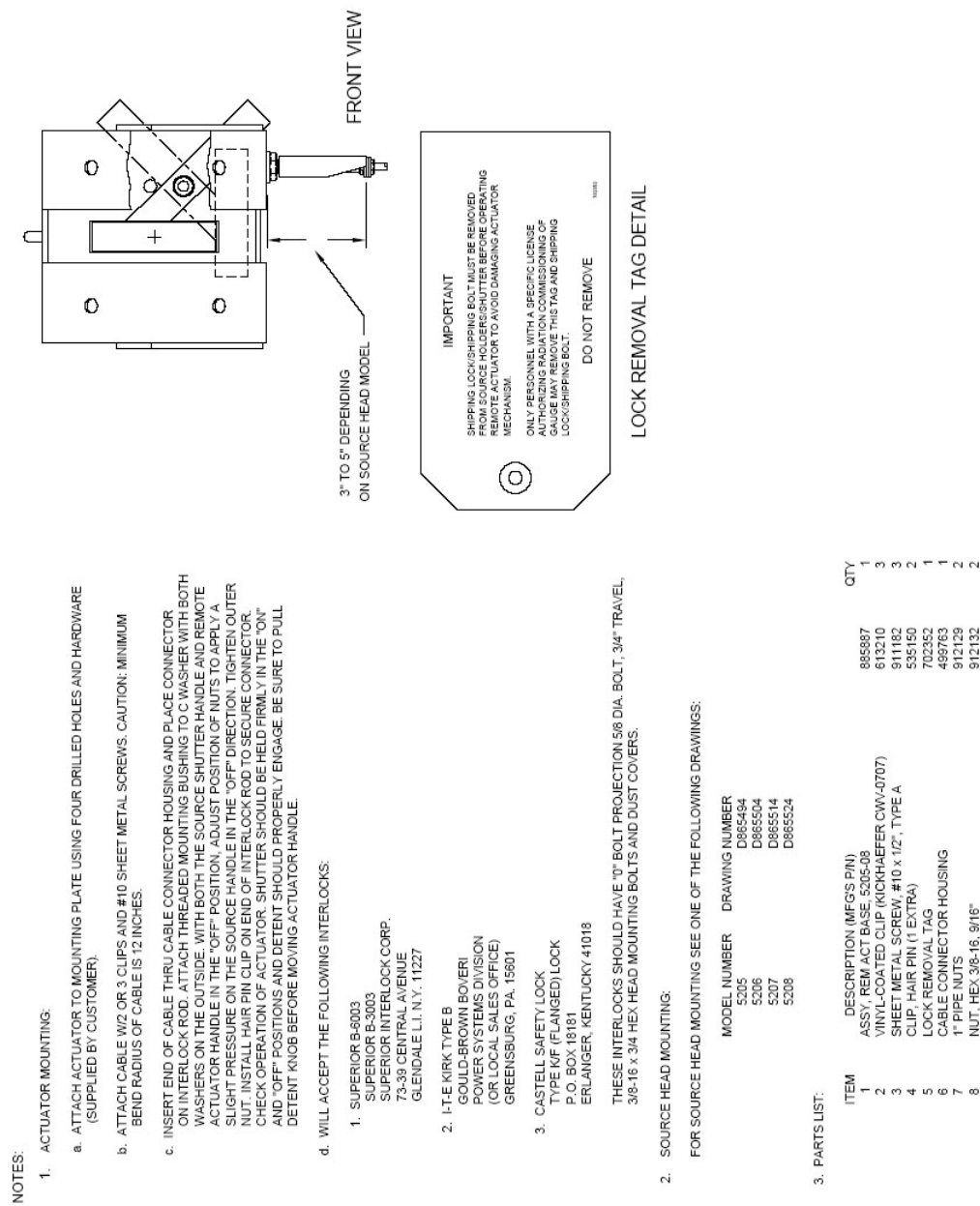
1. SUGGESTED CONNECTION: CUSTOMER SUPPLIED.  
USE A 4-WAY VALVE EITHER SOLENOID OR MANUAL OPERATION.  
THE SHUTTER OPERATION REQUIRES AIR FOR "ON" AND "OFF" POSITIONS.
2. OPERATING PRESSURE: 35 TO 150 PSI-MAX PRESSURE 250 PSI.  
AIR MUST BE CLEAN AND DRY OR USE A REGULATOR AND FILTER.
3. FLOW CONTROLS:  
ADJUST FOR A SHUTTER OPERATING TIME OF 1 TO 2 SECONDS  
FROM "ON" TO "OFF" AND "OFF" TO "ON" USING NORMAL AIR PRESSURE.  
AIR FLOWS ONLY DURING SHUTTER OPERATION.  
AIR FLOW VARIES WITH SHUTTER OPERATING TIME.
4. POSITION INDICATOR SWITCH:  
15A, 125VAC  
35A, 125VDC  
SPDT CONTACTS

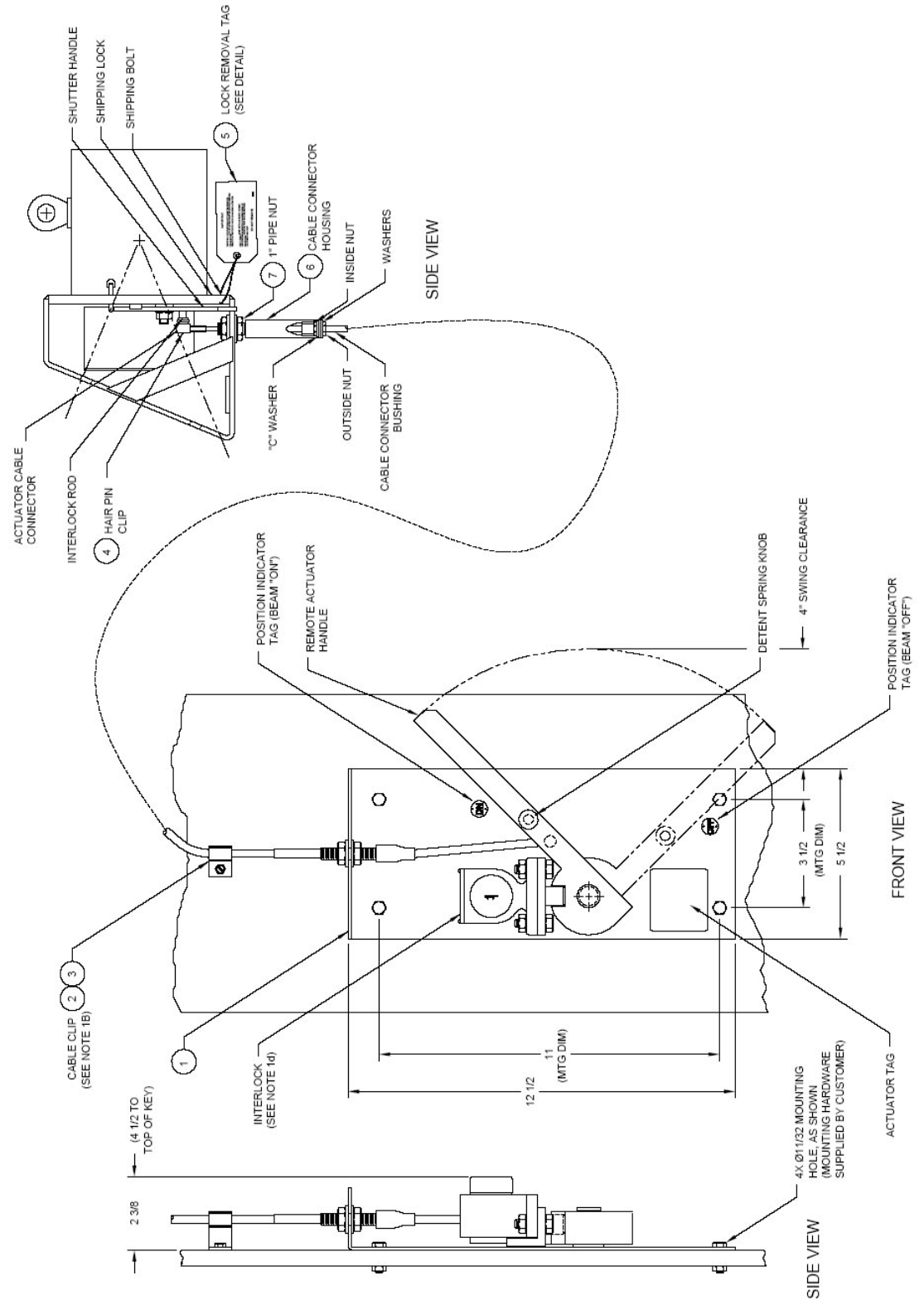


SEE SOURCE HEAD MOUNTING DWG.  
FOR ADDITIONAL INFORMATION.

SHUTTER-885585, PNEU. KIT  
BIMBA, CYLINDER PART NO. 098-DX

**Figure C-35.** 866664: Models 5205–5208 pneumatic actuator and position switch (sheet 1 of 1)





**Figure C-37.** 867269: Mounting instructions, remote manual actuator, Models 5205-5208 (sheet 2 of 2)

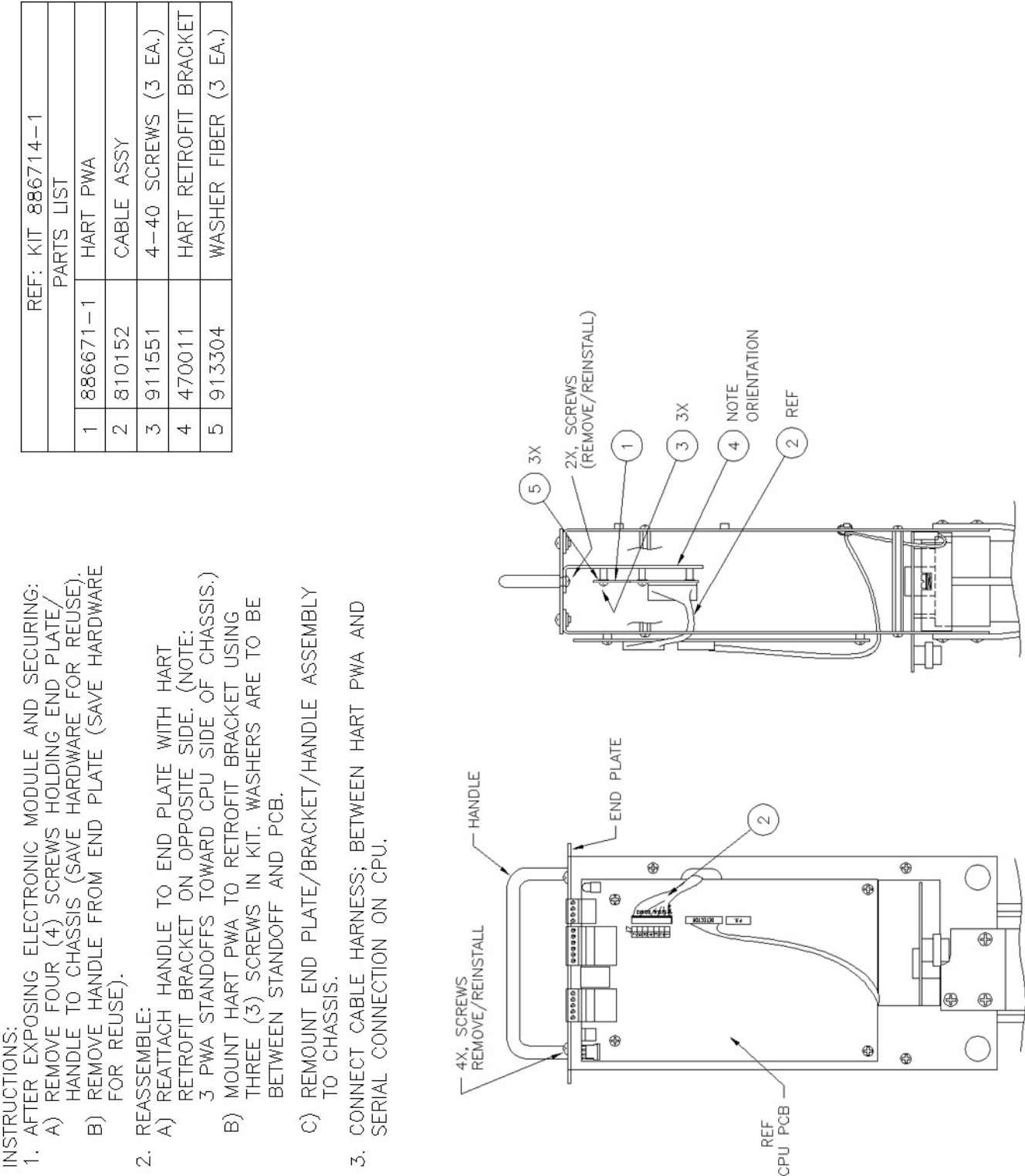


Figure C-38. 868709: HART retrofit, LevelPRO

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